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AQUAPHYTE

UNIVERSITY OF FLORIDA
CENTER FOR AQUATIC PLANTS
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

With Support From
The Florida Department of Natural Resources
The U.S. Army Corps of Engineers, Waterways Experiment Station,
Aquatic Plant Control Research Program

Volume 11 Number 1 Spring 1991 GAINESVILLE, FLORIDA ISSN 0893-7702

Second Training Video Available for Herbicide Applicators

How To Determine Areas and Amount of Aquatic Herbicide to Use

Understanding and using mathematical equations is an everyday requirement for aquatic herbicide applicators. Applicators must also know these equations in order to pass Florida's certified pesticide applicators certification examination, aquatics category. This 35-minute video tutorial was designed to help Florida's aquatic herbicide applicators better understand and use mathematical equations in their work.

Dr. Ken Langeland, IFAS Extension Specialist in Aquatic Plants, is the instructor for the program, which closely follows and complements Chapter 9 of his newly published *Training and Reference Manual for Aquatic Herbicide Applicators* (see page 3).

Langeland uses field examples to teach:

- **the mathematics for determining area,**
- **laying out plots, and**
- **calculating PPM concentrations and tank mixes.**

VHS, S-VHS or PAL copies of this program may be purchased for $10.60 ($10.00 for non-Florida residents) payable to the University of Florida. Order from: IFAS Publications Office, IFAS Building 664, University of Florida, Gainesville, Florida 32611-0001, (904) 392-1764.

Aquatic Plants Extinct in Israel To Live Again

The Tel Aviv University Botanic Gardens, under the directorship of Dr. Moshe Agami, have established a conservation program aimed at saving Israel's endangered flora, especially the water plant species. They are employing the method of *ex situ* conservation (maintenance of plant species outside their natural habitat, in the Gardens' gene banks, which store the genetic stocks of different flora strains in a man-made controlled habitat).

The white water lily (*Nymphaea alba*) and the blue water lily (*Nymphaea caerulea*) are examples of two water plants which are being conserved at the Botanic Gardens. Both these populations of water lilies were unique because each marked in Israel, respectively, the southernmost and

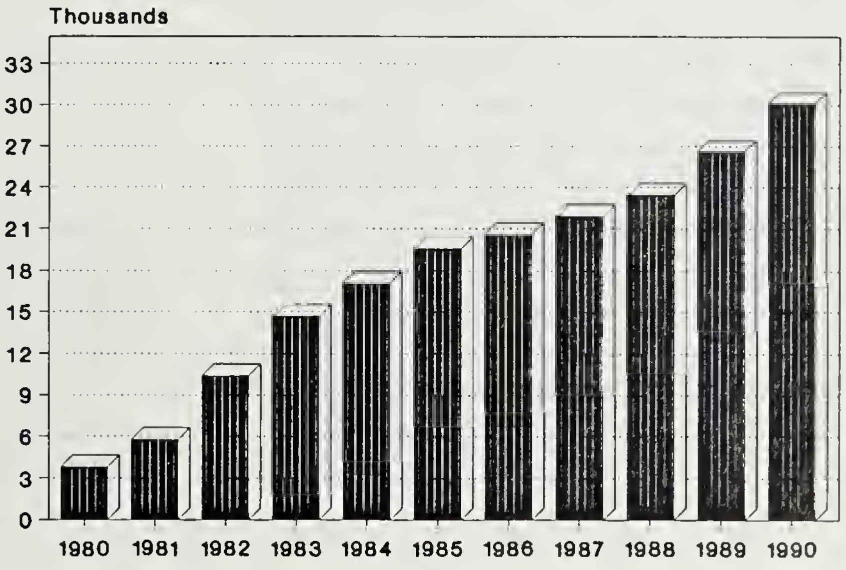
[See EXTINCT on page 9]

APIRS Database Grows To 30,000 Items

During the past ten years, the aquatic plant database has grown ten times - from 3,000 items in 1981 to 30,000 in 1991. That's thirty thousand research articles, books, and reports about freshwater macrophytes.

The database is used by hundreds of researchers, regulators, managers and students. If you too are interested in searching the database by species, keyword, subject, author or whatever, contact us:

Aquatic Plant Information Retrieval System (APIRS)
Center for Aquatic Plants
University of Florida, IFAS
7922 N.W. 71st Street
Gainesville, Florida 32606, (904) 392-1799



More Aquatic Plant Videotape Programs Available

Identification Program - Floating and Floating Leaved Plants

This aquatic plant identification videotape features 13 of the most common floating and floating leaved plants in Florida. It is the first of four programs which will enable non-botanists to identify 80 of the most common aquatic plants in Florida.

Aquatic plants are described in everyday language and shown in field and closeup situations. Important identifying characteristics are shown and described. For those who want to know more, an accompanying index card lists other sources of aquatic plant identification information.

Users of these programs include high school and college students, waterfront homeowners, fishermen and other recreational water users, and, of course, managers of Florida's lakes and rivers.

The second identification program will be **Emersed Plants**, featuring 25 emersed aquatic plants common in Florida. It should be available in June.

VHS, S-VHS or PAL copies of this program may be purchased for $10.60 ($10.00 for non-Florida residents) payable to the University of Florida. Order from: IFAS Publications Office, IFAS Building 664, University of Florida, Gainesville, Florida 32611-0001, (904) 392-1764.

AQUATIC HERBICIDE CALIBRATION INFORMATION

$$\text{GPA (Gals/Acre)} = \frac{\text{GPM (Gals/Min)}}{\text{Acres/Min}}$$

$$\text{PPA (Pounds/Acre)} = \frac{\text{Pounds/Min}}{\text{Acres/Min}}$$

$$\text{Acres/Min} = \frac{2\ \text{(Swath (Ft) X Speed (MPH)}}{1000}$$

$$\text{Speed (MPH)} = \frac{\text{Ft/Min}}{88}$$

$$\text{Acres/Tank} = \frac{\text{Tank Vol (Gals)}}{\text{GPA}}$$

Acre = 43,560 sq. ft.

Acre Feet in Plot = No. Acres X Avg. Depth (ft.)

Acre Foot = 1 acre of water 1 foot deep = 43,560 ft^3 = 2.7 million lbs. of water

1 PPM (Parts per Million) = 2.7 lbs. Active Ingredient per Acre Foot

IFAS UNIVERSITY OF FLORIDA

Calibration Cards Are Free

Credit card-sized laminated reference cards are now available to aquatic herbicide applicators. The cards include the most commonly used equations for field applications, as well as several important telephone numbers. These cards are free and may be ordered from the Center for Aquatic Plants, **(904) 392-9613.**

APM Spotlight

MR. TERRY WARSON

- **Job Title:** Lead Aquatic Plant Technician, Citrus County Aquatic Services, Lecanto, Florida. **Recipient, FAPMS 1990 Applicator of the Year Award.**
- **Duties:** Supervise aquatic plant harvesting operations, conduct plant surveys and identify plants, and answer questions from public.
- **Biggest Challenge:** "I want to help build the fisheries in Citrus County back up to what it once was."
- **Personal Goal:** As a "lover of all wildlife" and an avid hunter/fisherman, Warson would like to become an outdoor sports writer.
- **Community Activities:** Board member, Citrus County Lake Improvement and Sports Association. Among other things, the organization raises fingerling bass for release in public waters.
- **Unwinds With:** Wife, Maggie. This outdoors couple "do everything together", including surface arrowhead hunting, a favorite pasttime.

AT THE CENTER

Put An Aquatics Manual On Your Desk!

The all-new *TRAINING AND REFERENCE MANUAL FOR AQUATIC HERBICIDE APPLICATORS* has been published and is available for sale. This is *the manual* for those who manage aquatic plants and for those who wish to study for Florida's certified pesticide applicators certification examination, aquatics category. The manual was edited and prepared by Dr. Kenneth Langeland, UF/IFAS Extension Specialist in Aquatic Plants.

Chapters include:
History of Aquatic Plant Management
Aquatic Plant Management Decision Making
Laws Pertaining to Aquatic Plant Management
Herbicide Technology
Herbicide Safety
Adjuvants in Aquatic Plant Management
Equipment Selection and Methods of Application
Applying the Right Amount of Herbicide
Other Methods of Aquatic Plant Management
Environmental and Public Health Relationships
Aquatic Plant Identification

Manuals (**Publication # SM-3**) are available for sale from IFAS Publications Office, IFAS Building 664, University of Florida, Gainesville, Florida 32611-0001, (904) 392-1764. The cost is $7.00, including postage. Make checks payable to "University of Florida".

Chapter 9 of this manual, **Applying the Right Amount of Herbicide,** has been put to videotape. Applicators and their supervisors should consider obtaining this videotape program, which was designed to help applicators better understand and use mathematical equations in their work. See page 1 for details.

RETIRING? MOVING?

PLEASE DON'T THROW IT AWAY!

The Aquatic Plant Information Retrieval System (**APIRS**) will be happy to accept your reprints, books and reports. **ANYTHING ABOUT ANYTHING** about aquatic plants will be cataloged and entered into the Aquatic Plant Database and made available to your fellow researchers. Contact APIRS at the address on page 16.

Research Review and Short Course

The little blue heron (above) helped illustrate Mr. Mark Hoyer's talk (UF/IFAS Department of Fisheries and Aquaculture) on the relationship between aquatic macrophytes and aquatic avian fauna at the Florida Aquatic Plant Research Review Meeting and the Advanced Short Course. The meetings, held March 12-13 at the TREEO Center in Gainesville, were filled to capacity by almost 150 attendees. The events were sponsored by the UF/IFAS Center for Aquatic Plants.

The advanced short course covered the use of adjuvants and included talks on sinking agents,drift control, and other adjuvant products currently being used in aquatic plant management programs. Those who attended both days of the meeting were able to earn up to 12.5 CEU credits in right-of-way, aquatic or research and demonstration categories of certification.

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Dr. Joseph Joyce, Director

Florida Natural Areas Inventory - Rare and Endangered Aquatic Plants

The Florida Natural Areas Inventory (FNAI) recently completed a statewide "matrix" of specially protected rare and endangered plants and vertebrates in Florida. It is published in *Matrix of Habitats and Distribution by County of Rare/Endangered Species in Florida,* 1990, J.W. Muller, Coordinator, FNAI, Tallahassee (904/224-8207).

The matrix includes the following aquatic plant species that are federally- and/or state-listed. Also shown here are the Florida counties in which the plants occur:

*Balduina atropurpurea (*Purple balduina)
- Nassau

Bumelia thornei (Buckthorn)
- Calhoun, Gadsden, Jackson, Jefferson, Liberty, Marion, Putnam, Wakulla

Campanula robinsiae (Brooksville bellflower)
- Hernando

Coelorachis tuberculosa (Piedmont jointgrass)
- Baker, Brevard, Calhoun, Franklin, Hernando, Highlands, Lake, Marion, Martin, Orange, Putnam, Seminole, Volusia, Washington

Crataegus phaenopyrum (Washington thorn)
- Wakulla, Washington

Cryptotaenia canadensis (Canada hornwort)
- Gadsden, Jackson, Liberty

*Drosera intermedia (*Spoon-leaved sundew)
- Bay, Calhoun, Escambia, Franklin, Gulf, Highlands, Leon, Levy, Marion, Okaloosa, Putnam, Santa Rosa, Walton

Halophila johnsonii (Johnson's seagrass)
- Brevard, Dade, Indian River, Martin, Palm Beach, St. Lucie

Harperocallis flava (Harper's beauty)
- Franklin, Liberty

Hymenocallis coronaria (Stream-bank spiderlily)
- Putnam, Walton

Hymenocallis henryae (Panhandle spiderlily)
- Gulf, Liberty, Walton

Hypericum edisonianum (Edison's ascyrum)
- Desoto, Glades, Highlands

Hypericum lissophloeus (Smooth-barked St. John's-wort)
- Bay, Washington

Juncus gymnocarpus (Coville's rush)
- Okaloosa, Walton

Lilaeopsis carolinensis (Carolina lilaeopsis)
- Bay, Escambia, Okaloosa, Walton

Lilium iridollae (Panhandle lily)
- Escambia, Leon, Okaloosa, Santa Rosa, Walton

Linum westii (West's flax)
- Baker, Calhoun, Franklin, Gulf, Jackson, Liberty

Lythrum curtissii (Curtiss' loosestrife)
- Bay, Calhoun, Frankling, Gadsden, Levy, Liberty

Lythrum flagellare (Lowland loosestrife)
- Charlotte, Collier, Dade, Desoto, Glades, Hendry, Lee, Manatee, Okeechobee, Osceola, Sarasota

Macranthera flammea (Hummingibrd flower)
- Bay, Calhoun, Escambia, Franklin, Jackson, Leon, Liberty, Okaloosa, Santa Rosa, Walton

Medeola virginiana (Indian cucumber-root)
- Gadsden, Leon, Santa Rosa

Myriophyllum laxum (Piedmont water-milfoil)
- Escambia, Franklin, Gulf, Jackson, Jefferson, Leon, Liberty, Osceola, Pasco, Putnam, Santa Rosa, Taylor, Volusia, Wakulla, Walton

Nuphar luteum ssp *ulvaceum* (West Florida cowlily)
- Calhoun, Jackson, Okaloosa, Santa Rosa

Nymphaea jamesoniana (Sleeping-beauty water-lily)
- Charlotte, Citra, Desoto, Hillsborough, Lee, Levy, Sarasota

Oxypolis filiformis ssp *Greenmanii* (Giant water-dropwort)
- Bay, Calhoun, Gulf

Panicum abscissum (Cutthroat grass)
- Broward, Hendry, Highlands, Osceola, Polk

Panicum nudicaule (Naked-stemmed panic grass)
- Escambia, Santa Rosa

Peltandra sagittifolia (Spoon-flower)
- Baker, Calhoun, Clay, Columbia, Duval, Escambia, Gilchrist, Hardy, Highlands, Hillsborough, Jefferson, Lake, Levy, Marion, Nassau, Okaloosa, Orange, Pine, Polk, Putnam, Santa Rosa, Taylor, Union, Volusia, Walton

Physocarpus opulifolius (Eastern ninebark)
- Calhoun, Jackson

Physostegia godfreyi (Apalachicola dragon-head)
- Bay, Calhoun, Franklin, Gulf, Liberty, Walton

Physostegia leptophylla (Slender-leaved dragon-head)
- Citrus, Clay, Desoto, Dixie, Duval, Flagler, Franklin, Hillsborough, Jackson, Levy, Osceola, Polk, Putnam, Volusia, Wakulla

Pinguicula ionantha (Violet-flowered butterwort)
- Bay, Franklin, Gulf, Liberty, Walton

Pinguicula planifolia (Chapman's butterowrt)
- Bay, Calhoun, Escambia, Franklin, Gulf, Jackson, Leon, Liberty, Santa Rosa, Walton, Washington

Polygonum meisnerianum (Mexican tear-thumb)
- Alachua, Jefferson, Leon

Potamogeton floridanus (Florida pondweed)
- Escambia, Santa Rosa

Rhexia parviflora (A meadowbeauty)
- Bay, Calhoun, Franklin, Gulf, Liberty, Okaloosa

Rhexia salicifolia (Panhandle meadowbeauty)
- Bay, Calhoun, Leon, Wakulla, Walton, Washington

Rhynchospora crinipes (Hairy-peduncled beak-rush)
- Santa Rosa

Rhynchospora punctata (Pineland beak-rush)
- St. Johns

Rudbeckia nitida (St. John's-susan)
- Bay, Clay, Manatee, St. Johns

Salix floridana (Florida willow)
- Alachua, Columbia, Jackson, Jefferson, Lafayette, Lake, Levy, Marion, Orange, Putnam, Seminole, Suwanee

Salpingostylis coelestina (Bartram's ixia)
- Baker, Bradford, Clay, Duval Putnam, St. Johns, Union

Sarracenia rubra (Sweet pitcher-plant)
- Escambia, Okaloosa, Santa Rosa, Walton

Sium floridanum (Florida water-parsnip)
- Dixie, Jackson, Levy

Vicia ocalensis (Ocala vetch)
- Lake, Marion

Xanthorhiza simplicissima (Yellow-root)
- Gadsden, Walton

Xyris drummondii (Drumond's yellow-eyed grass)
- Bay, Escambia, Gulf, Liberty, Santa Rosa

Xyris isoetifolia (Quillwort yellow-eyed grass)
- Bay, Gulf, Washington

Xyris longisepala (Karst pond xyris)
- Bay, Leon, Walton

Xyris scabrifolia (Harper's yellow-eyed grass)
- Bay, Calhoun, Escambia, Franklin, Gulf, Liberty, Washington

DISTINGUISHED AUTHOR VISITS

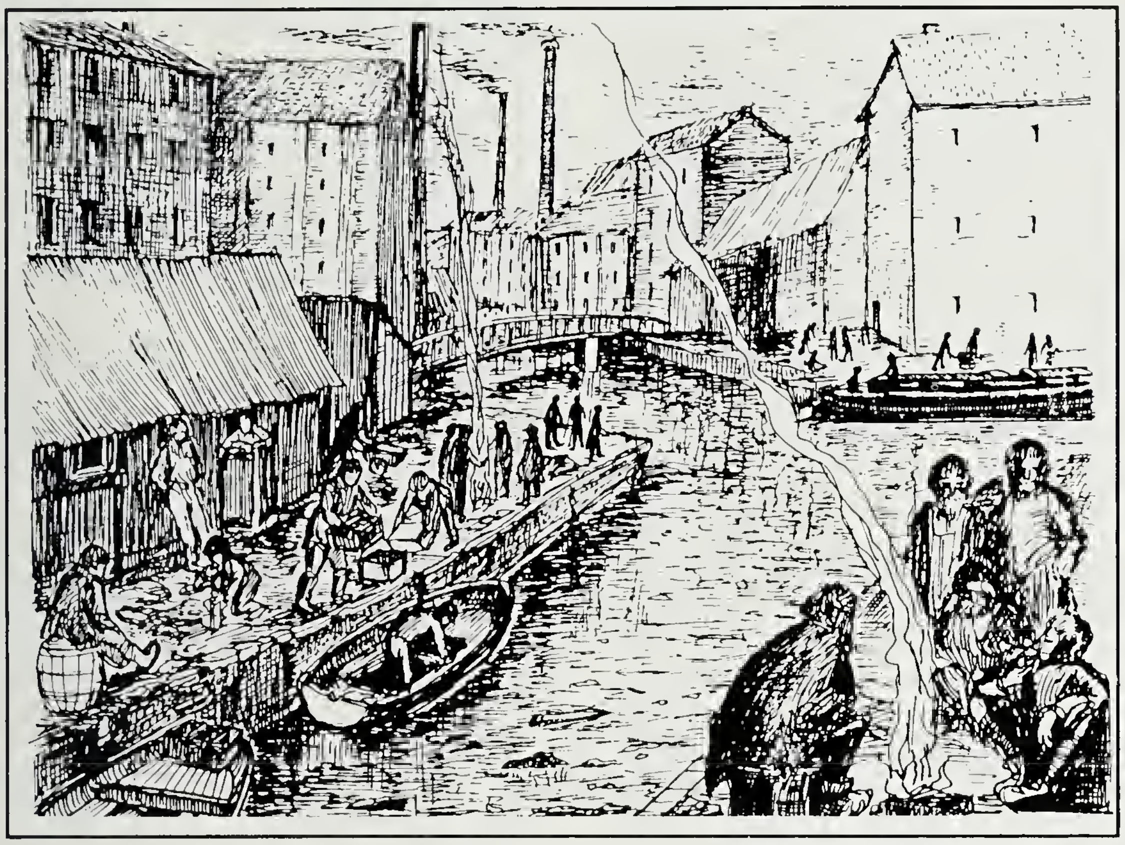


Illustration by Mrs. Y. Bower

DR. SYLVIA HASLAM, author of numerous books and articles on river vegetation, has been visiting Florida since November, courtesy of the University of Florida Botany Department, chaired by Dr. D.A. Jones.

Dr. Haslam has been working intensively in the **APIRS** library, reviewing the current literature on river ecology, *Phragmites,* a species on which she has written extensively, and recent U.S. wetlands research, particularly delineation, construction for water purification, and mitigation; she is impressed with American wetlands studies which are "very different to, as well as much more extensive than, European work."

In addition to her research, the author has been working on a new book, *HOW MUCH IS WRONG WITH YOUR RIVER?*, geared to naturalists and non-professional observers of aquatic systems. She has also written the first draft of another book, *RIVERS, REEDS AND HISTORY.*

In addition, Dr. Haslam has been visiting local rivers, meeting aquatic and wetland botanists, and attending seminars here at the university.

Dr. Haslam took all of her degrees from the University of Cambridge, including the career achievement degree of Doctor of Science, awarded in 1988. She has held university teaching posts in Malta as well as in Britain, and research posts at Cambridge. She returns to the Botany School at Cambridge in mid-April.

Dr. Haslam's most recently completed work is *RIVER POLLUTION: AN ECOLOGICAL PERSPECTIVE* (Belhaven Press, London and New York, 1990). This book contains a very interesting historical review of river pollution, including both ancient and modern illustrations of and poems about rivers. It discusses domestic and industrial pollution and its effects on plants, animals and ecosystems as a whole. Although the philosophy expressed in the book is universal, specific examples and data are taken from Europe. The book is intended "both for river specialists, and for undergraduates and those with a general interest in pollution."

In press is Dr. Haslam's *THE HISTORIC RIVER* (Cobden of Cambridge Press, Cambridge). Other books by the author include *BRITISH WATER PLANTS,* 1975; *RIVER PLANTS,* 1978; *RIVER VEGETATION: ITS IDENTIFICATION, ASSESSMENT AND MANAGEMENT*, 1981; *VEGETATION IN BRITISH RIVERS,* 1982; and *RIVER PLANTS OF WESTERN EUROPE,* 1987.

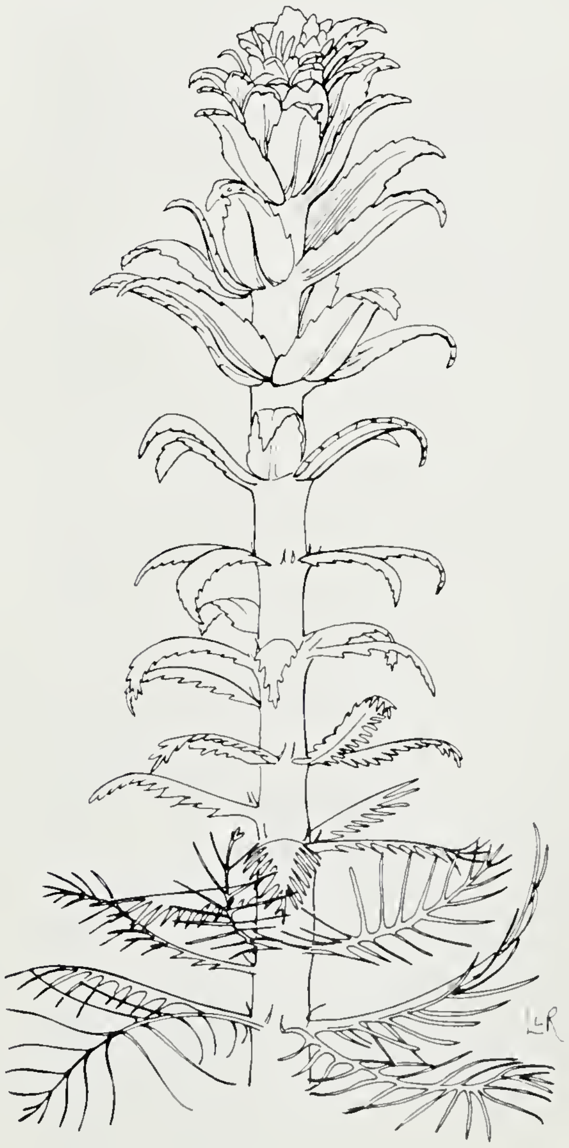
Aquatics

AQUATICS Magazine is an informative, four-color quarterly magazine, the official publication of the Florida Aquatic Plant Management Society (FAPMS). It features articles on aquatic plants and their control, particularly in Florida.

Special features deal with techniques of controls, new developments from industry, articles from regulatory agencies, discussions of legislative and administrative actions which affect aquatic plant management , and progress reports from the research community.

AQUATICS is edited by Mike Bodel of the South Florida Water Management District.

AQUATICS is included with membership in the FAPMS. To join the society, send $10.00 per year to Victor Ramey, Treasurer, FAPMS, Rt. 1, Box 217-A, Micanopy, Florida 32667.



Myriophyllum heterophyllum
Variable-leaf milfoil

BOOKS/REPORTS

WATER PLANTS FOR MISSOURI PONDS by J.R. Whitley, B. Bassett, J.G. Dillard and R.A. Haefner, Missouri Department of Conservation. 1990. 151 pages.

(Order from Missouri Department of Conservation, Box 180, Jefferson CIty, Missouri 65102. $9.00 includes postage, plus $.56 for Missouri residents.)

Large color photographs, excellent drawings, readable and interesting text, handsome un-cluttered design and very good quality production make this one of the best books of its type. (And it's certainly a bargain.) Sixty-eight aquatic plants are treated and include historical uses, ecological and commercial values, cultivation methods and suitability for ponds.

Though written with a Missouri emphasis, this book will be appreciated by water users in other states: naturalists and other outdoorsmen, water gardeners and anyone else interested in the natural history of freshwaters.

HYDRILLA - A CONTINUING PROBLEM IN FLORIDA WATERS, by K.A. Langeland, University of Florida IFAS Center for Aquatic Plants. 1990. 22 pages.

(Order free copies from Florida water management districts or from the Center for Aquatic Plants, 7922 N.W. 71st Street, Gainesville, Florida 32606.)

This is an update of the booklet, *HYDRILLA,* by W.T. Haller (1976). It includes chapters on the distribution, description, identification, biology, importance and management of Florida's number-one noxious aquatic weed, *Hydrilla verticillata.*

FISHING NAUTRAL LAKES, by D. Sternberg, The Hunting and Fishing Library. 1991. 160 pages.

(Order from The Hunting and Fishing Library, 5900 Green Oak Drive, Minnetonka, Minnesota 55343, (1-800-328-3895). $19.95.)

Extraordinary photography enhances this authoritative book on fishing in natural warmwater and "two-story" lakes (those with both warmwater and coldwater fish). The first section explains the complex set of physical and chemical factors of different natural lakes, and the trophic and depth changes that lakes can undergo.

The second, much larger, section concentrates on fishing techniques for specific gamefish, using seven lakes as "specific case studies to represent the fishing situations anglers are most likely to encounter." (Hydrilla-choked Lake Istokpoga is the case study for Florida bass lakes.) Each case study includes lake physical data, different habitat photos, high-altitude photos, maps, and more. Baits, lures, techniques and equipment are described and pictured for each specific lake type: far north, "two-story", midwestern walleye, bass panfish, Florida bass, and oxbow lakes.

WETLAND ECOLOGY AND MANAGEMENT: CASE STUDIES, edited by D.F. Whigham, R.E. Good and J. Kvet, Kluwer Academic Publishers. 1990. 180 pages.

(Order from Kluwer Academic Publishers Group, P.O. Box 989, 3300 AZ Dordrecht, THE NETHERLANDS. US$ 95.00.)

This is a collection of 19 papers, most of which were presented at the 2nd International Wetlands Conference in Trebon Czechoslovakia, June 1984. The objectives of the book are to demonstrate that wetlands provide a variety of uses for man, and that a range of approaches will be required to protect their valuable functions.

The first section contains papers ranging from a conceptual approach to wetlands protection strategies in New Jersey, through a series of ecological observations from wetland reclamation projects in the USSR, to experimental data relating to the effects of fire and nutrients on marshes.

The other sections included papers from Europe, Africa, Asia and Australia covering coastal, lacustrine and riverine wetlands and peatlands. A wide variety of experimental methods and analyses have been included in this diverse assemblage of study sites and projects.

Although the scope of this book is perhaps a little too diverse for those seeking information on a specific type of wetland and management, it would be ideal for those requiring a broader appraisal of the variety of wetland research in progress throughout the world. As such it would provide a particularly good introduction to wetland studies for those entering the field.

A. Fox

PROCEEDINGS OF THE 1ST ANNUAL CONFERENCE OF THE SOCIETY FOR ECOLOGICAL RESTORATION, edited by H.G. Hughes and T.M. Bonnicksen, Society for Ecological Restoration. 1990. 593 pages.

(Order from Society for Ecological Restoration, The University of Wisconsin Arboretum, 1207 Seminole Highway, Madison, Wisconsin 53711, (608) 262-9547.)

This is the proceedings of the January 16-20, 1989 meeting in Oakland, California. Sixty-two papers are divided into 14 major sections ranging from the very general to the very specific. Many of the papers have to do with restoration of wetlands, streams and lakes.

IRRIGATION PLANNING AND PREVENTION OF BILHARZIA; 1990 COSTS, Handbook One, by W.R. Jobin, Blue Nile Associates, 1990.

(Order from Blue Nile Associates, P.O. Box 542, Foxboro, Massachusetts 02035-0004, (508) 543-6634. $48.00.)

This very interesting "handbook" works to resolve a deadly dichotomy: on one hand, construction of water control systems is essential to the development of national food supplies in developing countries; on the other hand, constructing these systems also greatly facilitates the spread of parasitic diseases that kill and debilitate *millions* of people and livestock.

Bilharzia, malaria, liver fluke and other tropical diseases are carried by certain species of snails and mosquitoes. These vectors are spreading via poorly designed or inadequately maintained water control systems.

This book "details practical engineering methods to prevent the snails from colonizing irrigation canals and reservoirs." In addition to presenting design criteria, the author also demonstrates that aquatic weed control is an essential weapon in the fight against these diseases.

HABITAT MANAGEMENT FOR MIGRATING AND WINTERING WATERFOWL IN NORTH AMERICA, edited by L.M. Smith, R.L. Pederson and R.M. Kaminski, Texas Tech University Press, 1989. 560 pages.

(Order from Texas Tech University Press, Marketing, Lubbock, Texas 79409-1037, (800) 832-4042. $25.00 (cloth).)

This bargain-of-a-book includes state-of-the-art information on habitat management for nonbreeding waterfowl in North America. It is an excellent general reference for wetland and water managers whose aquatic plant-, mosquito- and water-control activities could affect migrating and overwintering water birds.

Twenty chapters "address waterfowl ecology and management for key habitats in the Atlantic, Mississippi, Central and Pacific flyways." Wetland types and aquatic plant species are discussed in detail in relation to waterfowl needs in these four main flyways.

ECOSYSTEMS OF FLORIDA, edited by R.L. Myers and J.J. Ewel, with forward by M.H. Carr, University of Central Florida Press, 1990. 765 pages.

(Order from University Presses of Florida, 15 N.W. 15th Street, Gainesville, FL 32611, (904) 392-1351. $75.00 hard, $29.95 soft.)

This Florida reference book begins with introductory sections about ecosystem classification, climate, soils and biogeography of Florida. The second section includes chapters on pine flatwoods and dry prairies, scrub and high pine systems, temperate hardwood forests and South Florida's rocklands. Part III is about freshwater wetlands and aquatic ecosystems, with chapters on swamps, marshes, lakes, rivers and springs. The last section is about Florida's coastal ecosystems, dunes and maritime forests, salt marshes, mangroves, inshore marine habitats and coral reefs.

The concluding chapter of this book is a call to Floridians to continue and expand their efforts to prevent further destruction of Florida's ecosystems. The editors discuss four major threats to conservation and ecosystem management: land conversion, fire exclusion, exotic species and water use demands.

APPLICATION OF WETLAND VALUATION THEORY TO COMMERCIAL AND RECREATIONAL FISHERIES IN FLORIDA, by F. W. Bell, Report No. 95, Florida Sea Grant College, 1989. 118 pages.

(Contact F.W. Bell at the Department of Economics, Florida State University, Tallahassee, FL 32306.)

This highly technical economics report derives economic values for estuarine wetlands in relation to commercial and recreational marine fisheries in Florida. The author uses the "marginal productivity theory" in this analysis.

The author estimates the average value of an acre of Florida salt marsh to be $2,276 (Florida west coast) and $9,811 (Florida east coast), in 1984 dollars.

EFFECT OF HERBICIDE APPLICATIONS ON THE MICRODISTRIBUTION AND POPULATION CHARACTERISTICS OF LARGEMOUTH BASS IN GUNTERSVILLE RESERVOIR, ALABAMA, by M.B. Bain and S.E. Boltz, Auburn University, Tennessee Valley Authority, 1990. 41 pages.

(Contact D.H. Webb, Project Officer, Aquatic Biology Department, Tennessee Valley Authority, P.O. Box 1010, Muscle Shoals, Alabama 35660.)

In this controlled study, 29 bass were monitored at several sites using radiotelemetry. At two sites, Eurasian watermilfoil (*Myriophyllum spicatum*) was treated with 2,4-D, hydrilla (*Hydrilla verticillata*) was treated with diquat and copper. The authors found that: "Overall, the results of this study provide no evidence that herbicide applications changed largemouth bass abundance, altered population size structure, affected fish condition, or induced movement and redistribution of largemouth bass."

LES JARDINS AQUATIQUES, UN REVE, UN DEFI, UNE DECOUVERTE! by J.-M. Jurdant, Vander Publ., 1987. 320 pages. (In French.)

(Order from Jiffy Plant International, 63 Rue de Grimohaye, B-1350 Limal, BELGIUM.)

This lavishly produced large-format book is about the history, design and construction of aquatic gardens. It is illustrated with hundreds of color photos.

An excellent feature of this book is a plant selection chart that is useful for all temperature zones. Included are sections about varieties of water lilies, lotus plants and irises, complete with color selection charts and vivid photographs. Chapters on aquatic trees, frogs, snails and waterfowl, and the selection and care of koi complete this impressive book.

CONSTRUCTED WETLANDS IN WATER POLLUTION CONTROL, Proceedings of the International Conference on the Use of Constructed Wetlands in Water Pollution Control, held in Cambridge, UK, 24-28 September 1990, edited by P.F. Cooper and B.C. Findlater, Pergamon Press, 1990. 605 pages.

(Order from Pergamon Press, Headington Hill Hall, Oxford OX3 OBW, England.)

In recent years, the use of aquatic plant-based systems for sewage, mining and industrial wastewater treatment has received much attention. Nowhere has more research work on the subject been done than in Europe, where scientists collaborate to establish design and operations standards for these novel systems.

This conference brought together European and other experts in the field for the second time. In this proceedings, seventy papers and posters presented at the conference are included.

Papers are in several sections: Principles, Nitrogen and Phosphorus Removal, Sewage Treatment, Sludge Treatment, Agricultural Waste Treatment, Treatment for Small Populations, Industrial Waste Treatment, Mining Waste Treatment, and Design Guidelines. Numerous case histories are also described.

NEW REGULATION: D.E.R. DREDGE AND FILL AND CATTAIL

The Florida Department of Environmental Regulation (DER) is responsible for the regulation of dredge and fill activities in the state. Chapter 17-312 of DER's rules and regulations specifies requirements for these activities.

Among the "general permits" granted by DER is one which directly relates to aquatic plant management. This new general permit became effective in December of 1990. Here is the text of this new permit:

17-312.819 General Permit for the Limited Dredging of Sediment for Aquatic Plant Management Purposes

(1) A general permit is hereby granted to any person engaged in limited dredging of sediment for aquatic plant management purposes, provided:

(a) This general permit shall apply to only those activities that have a valid Rule 16C-20, F.A.C., permit for aquatic plant control already issued by the Florida Department of Natural Resources in which the conditions for limited dredging have been set forth int he supplemental conditions of the Rule 16C-20 F.A.C., permit. For the purposes of this general permit, a valid Rule 16C-20, F.A.C., permit shall hereinafter be referred to as a valid Department of Natural Resources Aquatic Plant Control Permit;

(b) Sediment removal for aquatic plant management purposes shall be limited to only those lakes with naturally occurring sand bottoms, and only those vegetated areas within lakes, to their landward extent, that have a minimum of eighty percent areal coverage of Typha spp. (cattail) within the project area;

(c) Only unconsolidated, flocculent detrital material from decaying vegetation shall be removed under this general permit. The depth to which the detrital material may be removed shall be as determined by the Department of Natural Resources through a site inspection during the review of a Department of Natural Resources Aquatic Plant Control Permit, but in any event shall not exceed three feet of sediment, and in no case shall the removal include the natural mineral soil material which underlays the detrital material;

(d) Sediment removal shall not occur where the water depth above the unexcavated sediments exceeds three feet, or from areas which are located more than two hundred feet waterward of the existing water line, at the time of the Department of Natural Resources Aquatic Plant Control Permit application site inspection;

(e) The distance along the shoreline from which sediment may be removed shall not exceed five hundred linear feet;

(f) All spoil material shall be deposited in an upland spoil site which is located and designed so as to prevent the escape of spoil material into waters of the State. The deposition of material into the upland spoil site shall either be through direct deposit, or following initial deposition into self-contained trucks for transfer to the upland spoil site, or as the final step following the use of a temporary stockpile site. Temporarily stockpiled material may be located within the landward extent of waters of the State for a period not to exceed twenty four hours, and must be located within unvegetated areas or within areas from which sediments are identified to be removed in the Department of Natural Resources Aquatic Plant Control Permit. Temporary spoil stockpile sites shall not be located in areas of standing water, and must be placed and contained to prevent run-off into any areas of standing water;

(g) Dredged sites required by the Department of Natural Resources to be revegetated shall be planted according to specifications as defined in the Department of Natural Resources Aquatic Plant Control Permit. Only indigenous plant species obtained from a nursery source approved by the Department of Natural Resources shall be planted. Dredged sites required by the Department of Natural Resources Aquatic Plant Control Permit to be revegetated shall be planted at a minimum of fifty percent areal coverage within each revegetation area. The installation of vegetation required by the Department of Natural Resources Aquatic Plant Control Permit shall be completed within one year following notice to use this general permit. Within the project area, at least sixty percent areal coverage of the planted species or of other plant species which are listed in Rule 17-301.400, F.A.C., and which are found to be acceptable by the Department of Natural Resources Aquatic Plant Control Permit, shall be achieved within two years following installation of the required vegetation. The restored site shall also be managed in a manner where cattail and other undesirable plants, as determined by the Department of Natural Resources and specified in the Department of Natural Resources Aquatic Plant Control Permit, shall not be allowed to constitute more than ten percent areal coverage during the term of the valid Department of Natural Resources Aquatic Plant Control Permit;

(2) This general permit is subject ot the general conditions of Rules 17-4.530 and 17-4.540, F.A.C. and the following specific conditions:

(a) All sediment and cattail removal operations must conform to conditions imposed by the Department of Natural Resources Aquatic Plant Control Permit, and must be performed in a manner which does not cause violations of State water quality standards;

(b) The permittee shall use best management practices, such as properly installed and maintained turbidity curtains or similar devices, at all times during the execution of permitted activity to prevent violations of State water quality standards;

(c) Additonal dredging activities are not authorized by this general permit and shall not occur except as authorized by statute or Department rule;

(d) There shall be no filling or backfilling of any kind associated with the work other than incidental sediments which may be attached to vegetation which is planted pursuant to the valid Department of Natural Resources Aquatic Plant Control Permit;

(e) Dredging activities, when they occur on state-owned bottom land, shall be in accordance with the rules promulgated under the authority of the Board of Trustees of the Internal Improvement Trust Fund by the Division of State Lands, Department of Natural Resources.

Specific Authority: 403.814, 403.912, F.S.

Law Implemented: 403.061, 403.062, 403.087, 403.813, 403.814, 403.817, 403.912, 403.913, F.S.

History: New: 12-17-90.

Darth Vader Applicator

This is the "Space Face", a new shield that covers the forehead, eyes, nose, mouth, ears and chin. For more information, contact Millenium Safety Products, Austin, Texas, (512) 346-3876.

[From EXTINCT on page 1]

northernmost areas of distribution of their species.

"It is therefore, very sad that both these lilies can now only be found in the Botanic Gardens. If they were to die in the Gardens, they would be lost forever," explained Dr. Agami.

"Within the past 20 years, all but two of Israel's seven unique water plant species, once found abundant along the eastern sections of the Yarkon River, have vanished," said Dr. Agami. These species are the paper reed (*Cyperus papyrus*), water primrose (*Ludwigia stolonifera*), naiad (*Najas marina*), the coast clubrush (*Scirpus littoralis*) and the blue water lily.

"All together, at least 30 species of water plants have disappeared during the four decades since the State of Israel came into being. About 100 more species are at present in danger." He warned that if Israel does not change its priorities concerning plant and water conservation, "serious and irreversible damage could occur in Israel's aquatic habitats, affecting the country's entire ecosystem."

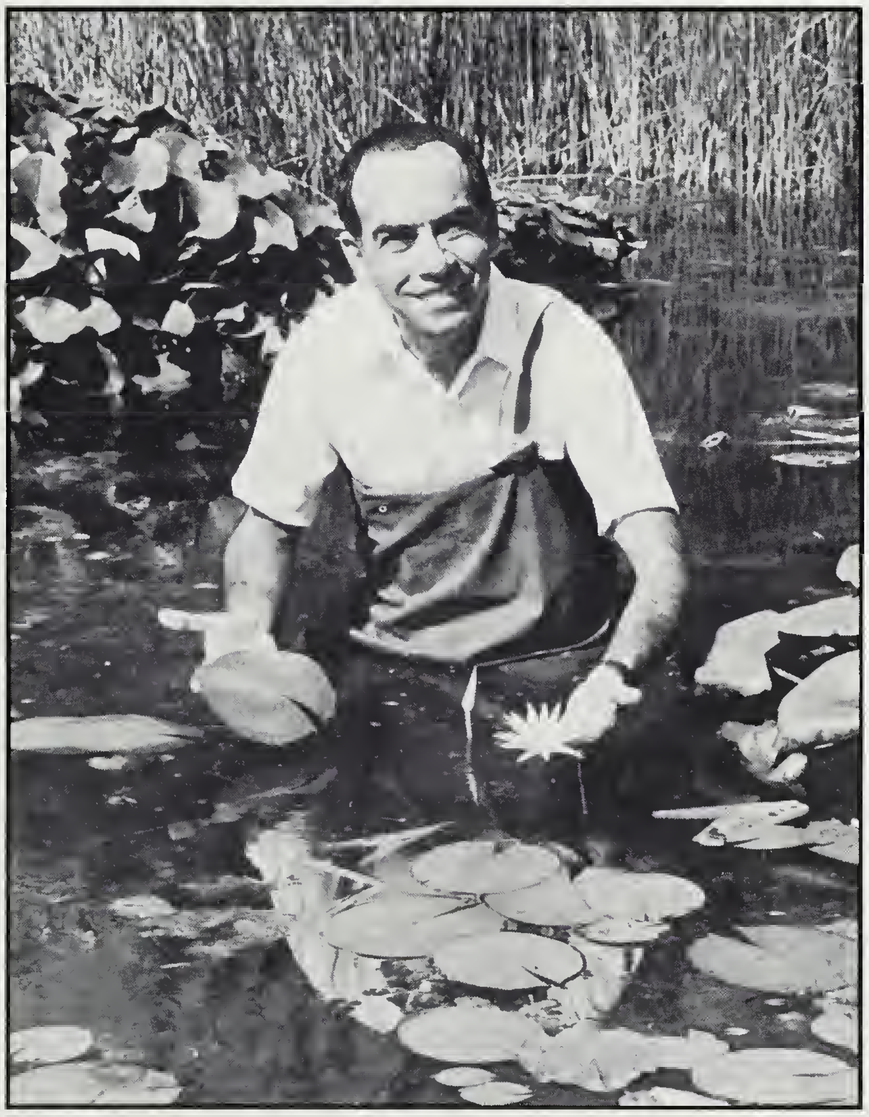
Reasons for Disappearance

There are several reasons for the disappearance of aquatic plants in Israel.

Nutrias (*Myocastor coypus*) are one of the major reasons for the disappearance of the blue water lily. Nutrias are large rodents introduced into Israel some 70 years ago for the fur industry, which later escaped from captivity.

"Nutrias are known to be especially fond of water plants, and in fact are appreciated for this quality by commercial fish-breeders, since they help keep fish ponds clear of vegetation," said Dr. Agami, adding, "We witnessed several instances of nutrias nibbling happily at the rhizomes of both the blue water lily and coast clubrush, which used to be very common along the upper Yarkon River."

Water pollution is responsible for the extinction of certain water plants from the Alexander and Yarkon Rivers in Israel, according to Agami. The flow of urban and industrial sewage into the rivers has induced profound changes in the water quality and as a result large numbers of submersed and floating plant species have disappeared from polluted sections of these rivers. Dr. Agami explained that "the water pollution in these rivers is severe, mainly because the water resources in Israel are very limited, so that most of the surface water is used to the maximum and the rate of flow in the rivers is too low, considering the amounts of sewage dumped into them."



Dr. Moshe Agami with Nymphaea caerulea and N. alba

Destruction of special habitats - which occurs in reclamation of marshlands, drainage schemes, harnessing of springs and running water, and the lowering of the ground water level - has been the main factor for the disappearance of many species, according to Agami. The white water lily disappeared when Israel's Lake Hula was drained in the 1950s. The disappearance of this lake with its surrounding swamps caused the extinction of many water plant species that had found refuge in this unique habitat.

Gene Banks in Israel

Currently TAU botanists are carefully conserving Israel's extinct and endangered species of water plants in the lily ponds and gene banks of the Botanic Gardens. Recent funding from the "Keren Ha'Tzvi" (a national research fund of the Society for the Protection of Nature in Israel) will be used by the Gardens to conduct further research on the water plants. Dr. Agami is hopeful that they will be able to reintroduce these water plants back into their natural habitats. "Otherwise, water lily fanciers may have to seek these beautiful aquatic plants outside of Israel, even though this country has provided a home for these unique populations of water plants for untold centuries," he concluded.

Over the next 30-40 years, as many as 60,000 plant species around the world may be in danger of becoming extinct. In order to avoid such a tragedy, the International Union for Conservation of Nature, Worldwide Fund for Nature (IUCN-WWF) Plants Conservation Program was established in 1989. Its goal is to assert the fundamental importance of plants in conservation activities.

In addition, the TAU Botanic Gardens are part of a new organization, the IUCN Botanic Gardens Conservation Secreteriat (BGCS), which enables collaboration on an international level.

As gene extinction progresses, new gene pools are needed to meet the challenge arising from the gradual biological impoverishment of the planet. TAU's Botanic Gardens are participating in the world's conservation strategy to halt species extinction and to promote conservation. The Gardens are a major center of propagation of rare or extinct species, as well as a center for conservation research and development and public education.

Jean Robbins
Tel Aviv University

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic plant database since October, 1990.

The database has more than 30,000 items. To receive free bibliographies on specific plants and/or subjects, contact APIRS at the address shown on the mail label on page 16.

To obtain articles, contact your nearest state or university library.

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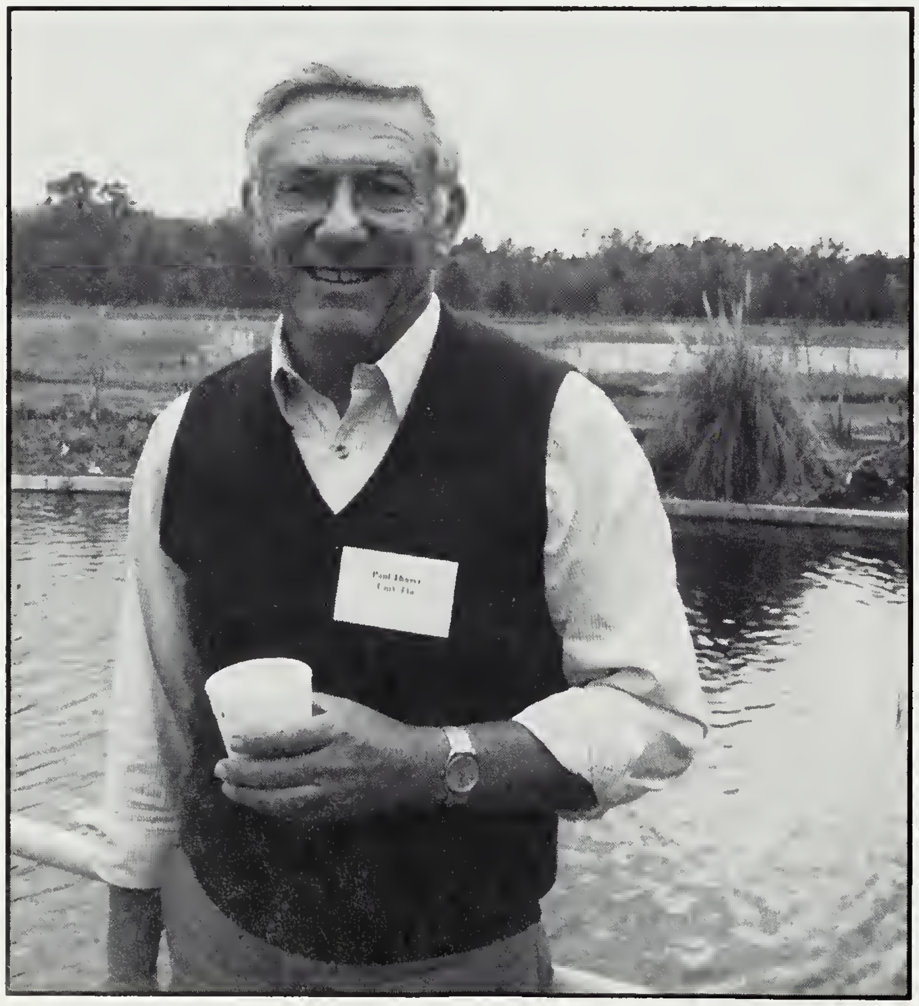
A LITTLE CLOSER

Paul Thayer moved back to Florida with his wife, Joan, in January 1988. He likes the weather, he had an offer to teach a college course, and his son, Dan, lived here with his wife and two children. He was also supposed to be retiring.

Since that time, he has taught two graduate level courses in herbicide technology, he has carried out independent research on diseases in, and herbicidal control of, torpedograss (*Panicum repens*), and he has worked on numerous research projects. Doesn't sound very retired, does it?!

Officially, Dr. Thayer holds a part-time post-doctoral position at the UF/IFAS Center for Aquatic Plants under a cooperative agreement with the USDA.

A quiet man, Paul tends to minimize his contributions to the field. His official boss, Dr. Bill Haller, is a bit more forthcoming. "Paul contributes interest, enthusiasm, and [tongue-in-cheek] at least a few years of experience. He has the patience and experience, and takes the long hours required to grind out the tough work in the greenhouse. Paul points us in the directions we need to go in the field work."



After two years in the Navy, Dr. Thayer went to school on the GI bill and worked part-time at an Ohio experiment sub-station for vegetable crops. Having worked at a factory during high school, where he says he didn't see too many people who were happy with their jobs, he was impressed by the enthusiasm of the experiment station researchers, even though they had been working in the same field for ten or twenty years. That enthusiasm pursuaded him to pursue this type of work as a career.

Dr. Thayer earned his doctorate in plant pathology from Ohio State University in 1958. He worked at the UF/IFAS Everglades Research & Education Center in Belle Glade from 1958 to 1965, researching vegetable crop diseases. From 1965 until his so-called retirement in 1988, he worked with Eli Lilly and Company (now Dow Elanco), field testing insecticides, fungicides and nematicides, and eventually acting as head of insecticide and fungicide testing and as regional manager for field research.

Paul described his work at Lilly as enjoyable, because he likes working with groups, and exciting, because he finds it rewarding to spend years working on a product that finally makes it to market and is successful. Products he has worked on include Sonar, Rubigan, Spike, Surflan, Paarlan, Sonalan and Cutless.

Paul's extensive knowledge of herbicide technology led to his teaching a graduate level course in the subject. In the course, Paul covers the pesticide testing and registration process, the history of herbicides, major chemical groups, methods for discovery and characterization of herbicides, formulations, history of government regulations, EPA registration requirements, labels, application, field testing, complaint handling, the manufacturing process and user considerations - in short, everything you ever wanted to know about herbicide technology from start to finish.

From the research end, Dr. Thayer continues his work on torpedograss (an exotic aquatic weed), studying diseases of the plant for possible biological controls, and the effects of Sonar under different application regimes. Field studies on herbicidal control of the weed under drawdown conditions have been conducted at West Lake Tohopekaliga where torpedograss is still under control almost four years after application. A similar study is now being conducted on East Lake Tohopekaliga. In greenhouse studies of torpedograss, Dr. Thayer continues to research the best application methods of Sonar by studying the mechanisms of uptake and the effects of surfactants.

What does Paul Thayer do in his spare time? He says he likes to fish for bass but claims he is not a "fancy fisherman". Rather he enjoys just being out in his Gheenoe on Florida's lakes and rivers. He likes to hike, especially in the West Virginia mountains and the Rockies, and plans to spend some time this summer on the west coast in his motorhome. He also enjoys classical music which, he says with a smile, his grandchildren refer to as "grandpa's music".

K. Brown

In the HOW THINGS CHANGE Department:

Burning water hyacinths with a kerosene weed burner, May 24, 1939.

MEETINGS

31st ANNUAL MEETING, AQUATIC PLANT MANAGEMENT SOCIETY. July 14-17, 1991, Hyatt Regency Hotel, Dearborn, Michigan.

In addition to general sessions on significant operational and research developments concerning aquatic plant management, the program will include papers especially about the major biological problems facing the Great Lakes.

For more information, contact Randall K. Stocker, Program Chairman, Imperial Irrigation District, P.O. Box 937, Imperial, California 92251.

THE INTERNATIONAL WETLANDS SYMPOSIUM. October 21-24, 1991, Hilton Hotel, Pensacola, Florida.

The symposium theme is: Constructed Wetlands for Wastewater Quality Improvement. It is sponsored by the Wetlands Research Laboratory and Institute for Coastal and Estuarine Research of the University of West Florida. A proceedings will be published.

For more information, contact Gerald A. Moshiri or Craig D. Martin, WRL & ICER, University of West Florida, 11000 University Parkway, Pensacola, Florida 32514. (904/474-2754 or 474-2052)

11TH ANNUAL INTERNATIONAL SYMPOSIUM, NORTH AMERICAN LAKE MANAGEMENT SOCIETY. November 11-16, 1991, Sheraton Denver Tech Center, Denver, Colorado.

The symposium theme is: Lake, Reservoir and Watershed Management in a Changing Environment.

For further information, contact NALMS, P.O. Box 217, Merrifield, Virginia 22116. (202/466-8550).

INTERNATIONAL SYMPOSIUM ON THE BIOLOGY AND CONTROL OF AQUATIC PLANTS, A Joint Meeting With The Aquatic Plant Management Society. July 12-17, 1992, Daytona Beach, Florida.

Topics for this symposium will include the ecology and photosynthesis of aquatic plants, the use of plant biology to develop better control methods, and environmental impacts of various management options. Post-meeting field trips to the Central Florida and Everglades areas are being planned.

For the first circular, contact George Bowes, Botany Department, University of Florida, Gainesville, Florida 32611. (Phone: 904/392-1891; Fax: 904/392-3993; Email (BITNET) BOWES@NERVM)

INTECOL'S IV INTERNATIONAL WETLANDS CONFERENCE. September 13-17, 1992, Columbus, Ohio.

The symposium theme is: Global Wetlands Old World and New. This is the fourth International Congress of Ecology conference on wetlands after those held in India (1980), Czechoslovakia (1984) and France (1988).

For more information, contact William J. Mitsch, Columbus '92 Wetlands Conference, School of Natural Resources, Ohio State University, 2021 Coffey Road, Columbus, Ohio 43210. (Phone: 614/292-9773; Fax: 614/292-7162)

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AQUAPHYTE

This is the newsletter of the Center for Aquatic Plants and the Aquatic Plant Information Retrieval System (APIRS) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Natural Resources, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District, and IFAS.

EDITORS: Victor Ramey
Karen Brown

AQUAPHYTE is sent to 3,000 U.S. and Canadian managers, researchers and agencies. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

Inclusion in AQUAPHYTE does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

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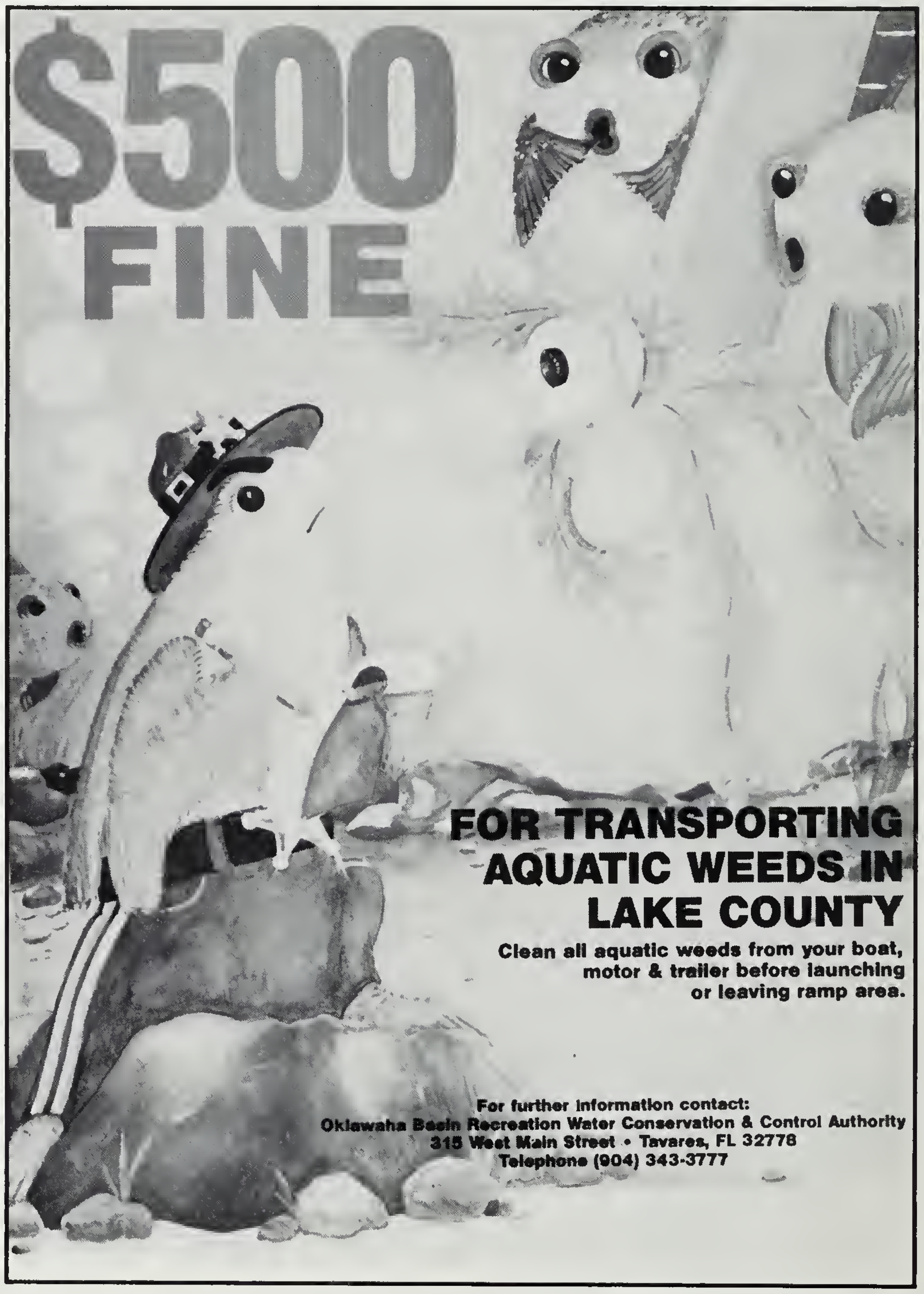
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With Support From
The Florida Department of Natural Resources, Bureau of Aquatic Plant Management
The U.S. Army Corps of Engineers, Waterways Experiment Station,
Aquatic Plant Control Research Program

Volume 11 Number 2 Fall 1991 GAINESVILLE, FLORIDA ISSN 0893-7702

Aquatic Vegetation in Volcanically Impacted Spirit Lake near Mount St. Helens, Washington

by Douglas W. Larson, Adjunct Professor, Department of Biology, Portland State University, Portland, Oregon 97207

[Editors' note. We asked Dr. Larson if anyone had studied the reestablishment of macrophytes in Spirit Lake after the Mount St. Helens eruption of 1980. Nobody had. Subsequently, Dr. Larson and Ms. Kristie Duyckinck made a trip to the lake to identify macrophytes that might have appeared there. Here is their report. The second part of this article is a review of the kinds of studies that have been conducted on the lake in the years since the eruption.]

Surprisingly, with the exception of limited work on post-eruption benthic algae (Ward *et al*, 1983), studies to determine the reestablishment or introduction of higher plant life in Spirit Lake have not been attempted. As indicated in the second part of this article, post-eruption limnological research focused primarily on the lake's phytoplankton community.

Recently, on 15 September 1991, we hiked across the blast zone of Mount St. Helens (alas, helicopter transportation is no longer available to visiting scientists) to collect macrophytes and other vegetative materials from Spirit Lake.

[See SPIRIT LAKE on page 4]

Ten years after the Mount St. Helens eruption, which macrophyte do you think is now dominant in Spirit Lake?

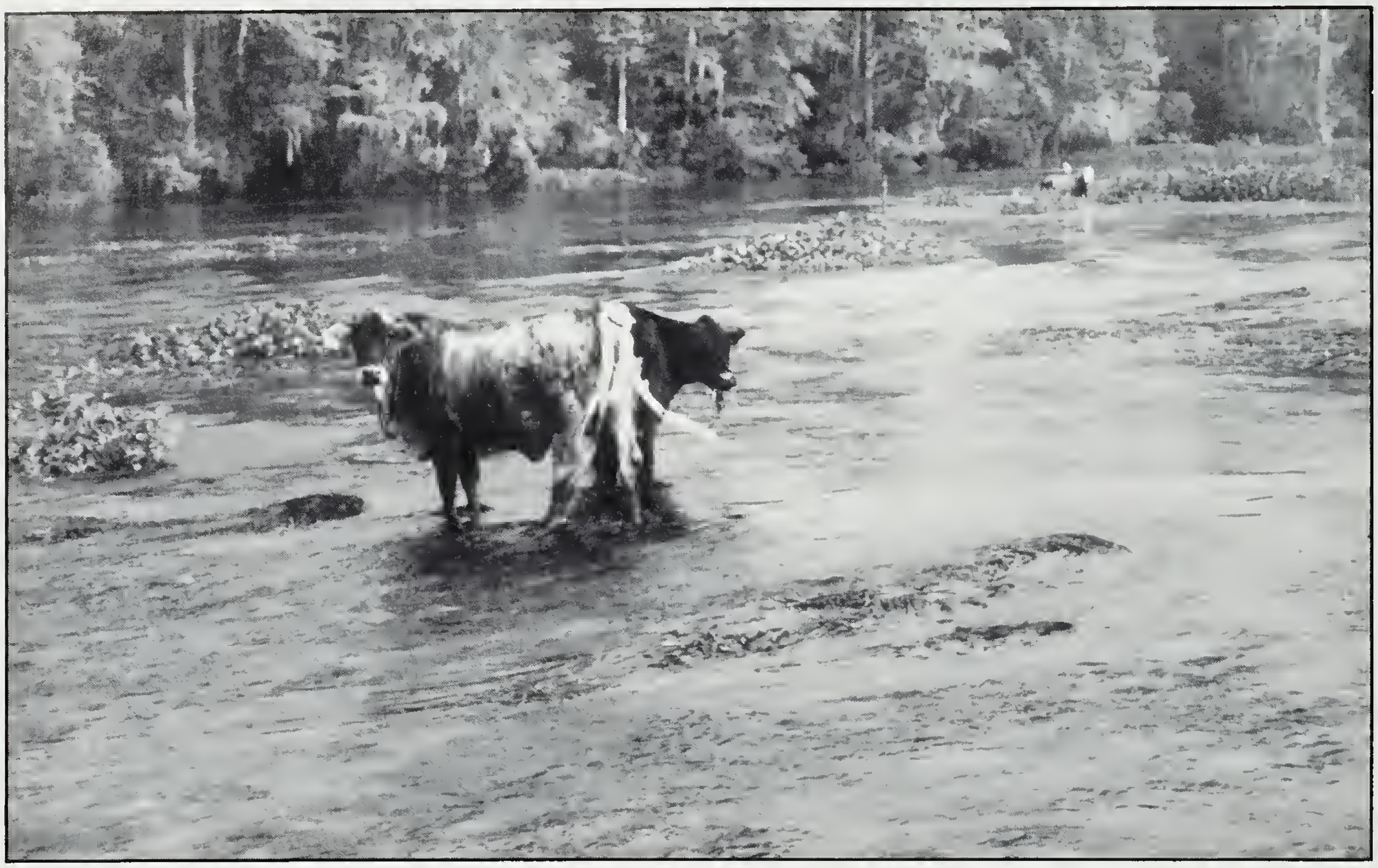
Ms. Judy Ludlow, DNR Regional Biologist and winner of the Equipment Demonstration Award, shows how a LORAN navigation device can be used to lay transects and large treatment areas on the open water.

Record Meeting

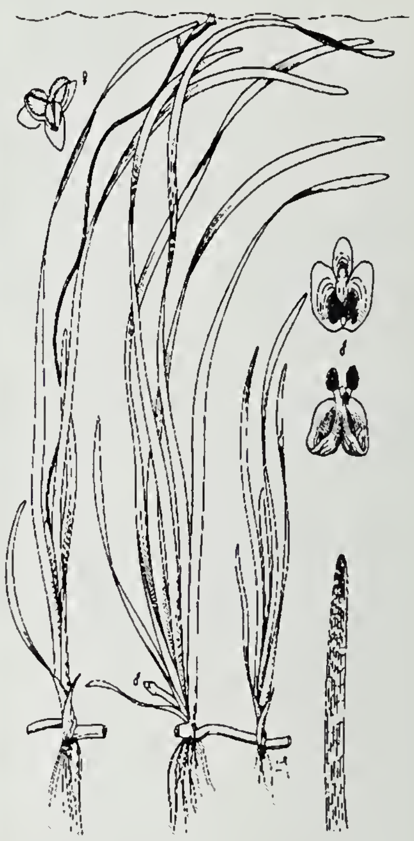
In spite of lean budgets, a record 480 people attended the annual meeting of the Florida Aquatic Plant Management Society (FAPMS) in Daytona Beach. They included former state senator, Tom Brown, new DNR Bureau Chief (see page 7).

At the three-day meeting, scientists, regulators, management people, and interested citizens heard each others' problems and solutions, and earned continuing education units (C.E.U.s) in the process.

Next year's meeting is in October in Clearwater.



Cows eat *Egeria*, *Vallisneria*, *Potamogeton* and *Sagittaria* on the St. Marks River, Florida.



Vallisneria americana

APM Spotlight

MR. FRED SCHUDEL

- **Job Title:** Aquatic Plant Technician, Lee County Hyacinth Control, **Recipient, FAPMS 1991 Applicator of the Year Award.**
- **Duties:** Helps manage the growth of nuisance aquatic plants in the Caloosahatchee River and in the canals of Cape Coral, and assists in the department's public education efforts, such as its annual Pond Management Workshop.
- **Biggest Challenge:** "I want to help new residents [from 'up north'] to understand how important aquatic vegetation is for maintaining healthy food webs."
- **Personal Goal:** A bachelor's degree in biology is in the future; Schudel takes junior college night classes, one course at a time.
- **Community Activities:** Fred is an active member of the New Life Fellowship Church of Punta Gorda.
- **Family Matters:** This "family man" enjoys the rest of his time with wife, Mary, and their five children, Becca, 1; Stephen, 3; Kate, 8; Sally, 16; and Kelly, 19. With a range of ages like that, we can see that Fred maintains a *very* active life indeed.

AT THE CENTER

EDUCATIONAL VIDEOTAPE PROGRAMS

A variety of subjects relating to aquatic plant management in Florida are treated in a number of videotapes being produced by the Center. This is the last year of a four-year grant, co-sponsored by the Florida Department of Natural Resources and funded from the Aquatic Plant Trust Fund. The programs produced under the grant so far are:

Florida's Aquatic Plant Story

For general and school audiences, this program describes the benefits of native aquatic plants, recounts problems caused by some exotic "aquatic weeds", and introduces the major methods of aquatic plant management. 24 minutes, IFAS - VT 315.

Istokpoga - Lake of Legends

This program tells the story of one of Florida's largest lakes, and the hydrilla infestation that made its waters all but unusable. 39 minutes, IFAS - VT 285.

Calibration - A Field Approach

For applicators and managers, this program "takes the mystery" out of calibrating handguns, booms and granular spreaders. 35 minutes, IFAS - VT 284.

How To Determine Areas and Amount of Aquatic Herbicide to Use

For applicators and managers, this program introduces some of the mathematics essential to the proper use and application of aquatic herbicides. 34 minutes, IFAS - VT 310.

Aquatic and Wetland Plant Identification

For everyone, this series is in seven parts, the first five of which are available immediately. See page 9 for more information.

Floating and Floating-leaved Plants	(IFAS - VT 360)
Emersed Plants (Part I)	(IFAS - VT 361)
Emersed Plants (Part II)	(IFAS - VT 369)
Submersed Plants (Part I)	(IFAS - VT 362)
Submersed Plants (Part II)	(IFAS - VT 370)
Grasses, Sedges, Rushes (Part I)	(IFAS - VT 363)
Grasses, Sedges, Rushes (Part II)	(IFAS - VT 371)

Available in VHS, S-VHS, or PAL formats. All programs cost $15.00 each, plus .90 tax for Florida residents ($15.00, non-Florida). Make checks payable to *University of Florida.* Order from: IFAS Publications, IFAS Building 664, Gainesville, Florida 32611-0001.

Dr. Donn Shilling and graduate student, Mr. Brian Smith, are studying the biology, ecology and management of torpedograss, Panicum repens. This weed is a serious pest in Florida where it is treated with the herbicide, glyphosate. However, extensive rhizomes and relatively little emersed foliage make the plant difficult to control. Shilling and Smith are trying to determine the right time of year or growth stage for maximum effect of herbicide treatment.

Florida Helps Minnesota

The Minnesota Department of Natural Resources Aquatic Nuisance Program recently contracted with the Center to review that state's aquatic plant management program, including its organization, research, permitting, funding and education efforts. Minnesota has emerging infestations of Eurasian water milfoil (*Myriophyllum spicatum*).

During September, Drs. William Haller, Alison Fox, Daniel Canfield and Joseph Joyce visited the Minneapolis-St.Paul and Brainerd areas. For their review, they toured milfoil infestation sites and interviewed DNR biologists, private applicators, harvester operators, homeowners and others.

Center Director Joyce noted that the water-using public in Minnesota "share many of the same concerns as Floridians" about how best to manage and protect their lakes and rivers.

The review should be complete by the end of this year.

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DR. JOSEPH JOYCE, DIRECTOR

[From SPIRIT LAKE on page 1]

Plant collections during this initial investigation were made entirely along the lake's south shore, which still receives high-temperature, chemically enriched geothermal seepwaters from the debris avalanche at the base of Mount St. Helens. This part of the lake is also shoaled by organically rich, chemically reduced muds, which provide a favorable substrate for the growth of benthic algae and rooted plants.

During the 15 September lake-visit, we collected 5 plant specimens, including *Rhizoclonium hieroglyphicum*, *Chara vulgaris*, *Myriophyllum spicatum*, *Juncus effusus*, and *Typha latifolia*. A cursory inspection of the lake's south shore indicated that these particular plants were preeminent; no other plants were observed.

Myriophyllum spicatum, Eurasian water milfoil, was by far the most abundant plant present. The significance of Eurasian water milfoil in Spirit Lake is twofold: first, milfoil - which was probably nonexistent in the lake before the eruption given the fact that the lake then was an ultraoligotrophic body of water occupying a relatively deep, steep-sided basin with minimal littoral area - was somehow introduced to the lake after the eruption and now proliferates in shallower, more fertile lakewaters. And second, because access to Spirit Lake is still greatly restricted, and is off-limits to recreation of any sort, milfoil was probably introduced by waterfowl flying in from milfoil-infested lakes and ponds.

There are no plans to eradicate the milfoil or control its spread, which is consistent with the Forest Service's policy of not interfering with the lake's natural evolution in a volcanically impacted setting. This insistence on letting natural processes prevail during the lake's recovery is evident in the fact that the Forest Service will not allow the restocking of Spirit Lake with fish, which reportedly were annihilated by prolonged whole-lake anoxia following the catastrophic eruption of Mount St. Helens.

POST-ERUPTION STUDIES

The catastrophic volcanic eruption of Mount St. Helens, Washington, on 18 May 1980, devastated vast forestlands, triggered massive landslides and mudflows, and filled several nearby lakes with timber and volcanic debris (Rosenfield, 1980; Kerr, 1980; Findley, 1981). The largest of the lakes impacted was Spirit Lake, located about 8 km north-northeast of the mountain's summit at elevation 975 m (above msl). What had been a pristine, ultraoligotrophic, relatively large (area = 5.1 km^2; maximum depth = 56 m; Wolcott, 1973), alpine lake was reduced within minutes to a roiling, steaming body of water choked with logs and mud (Rosenfeld, 1980; Findley, 1981).

Spirit Lake received enormous quantities of debris avalanche materials, timber, pyrolyzed forest vegetation, and minerals of magmatic and lithic origin. This influx greatly increased lake-water concentrations of inorganic chemical constituents, as well as dissolved and particulate organic matter. Much of the deposited organic material was incorporated in the lake's new sediment layer, which was roughly 50 to 60 m thick. The lake was also a depository for high-temperature pyroclastic flows and mudflows, ashfall, and geothermal waters, which increased lake-water temperatures to 33°C or higher (Dion and Embrey, 1981).

Unusually warm lake waters, acting in concert with the massive inorganic and organic loadings to Spirit Lake, prompted the lake's bacteria to proliferate rapidly: by 30 June 1980, aggregate bacteria in surface waters numbered 4.9×10^6 cells per ml, of which about 1×10^4 cells per ml were viable heterotrophic bacteria (Staley *et al*., 1982). These latter bacteria proceeded to decompose and oxidize organic matter found abundantly in the lake's water column and sediments. This process soon depleted the lake's supply of dissolved oxygen, except in the uppermost 1 to 2 meters where wind-driven surface aeration maintained a relatively small concentration of dissolved oxygen (about 2.5 mg/l) as late as 30 June 1980 (Wissmar *et al*., 1982). By early July, however, the lake became completely anoxic and remained so until November 1980 (Dahm *et al*., 1982; Larson and Geiger, 1982). Consequently, when all dissolved oxygen had

The exotic plant, Eurasian water milfoil (Myriophyllum spicatum), was found to be the most abundant macrophyte present in Spirit Lake, eleven years after its destruction by Mount St. Helens. Ms. Kristie Duyckinck stands in the new littoral zone of the greatly altered lake.

been depleted, the only organisms capable of surviving in Spirit Lake were obligately or facultatively anaerobic microorganisms (Dahm *et al.*, 1982).

The fate of other biological components of the lake's pre-eruption ecosystem, such as protozoans, phytoplankton, zooplankton, periphyton, macrophytes, insects, fish, and amphibians is largely unknown, although protozoans and some phytoplankton were collected or observed at Spirit Lake during the late summer and fall of 1980 (Larson and Geiger, 1982; Ward *et al.*, 1983; Larson and Glass, 1987). The water chemistry of Spirit Lake, described shortly before and after the eruption, is presented in Table 1:

Table 1. Water Chemistry of Spirit Lake, Washington, Before and After the Eruption of Mount St. Helens. Data from Wissmar et al., 1982.

Variable	4 April 80	30 June 80
Temperature (degrees C)	4.0	22.4
pH	7.35	6.21
Alkalinity (mg/l as $CaC0_3$)	6.95	150.5
Carbon, organic, dissolved (mg/l)	0.83	39.9
Carbon, organic, particulate (mg/l)	0.435	0.570
Calcium, dissolved (mg/l)	2.15	66.9
Magnesium, dissolved (mg/l)	0.48	13.2
Sodium, dissolved (mg/l)	2.00	67.2
Potassium, dissolved (mg/l)	0.40	16.0
Manganese, dissolved (mg/l)	undetected	4480.0
Iron, dissolved (mg/l)	undetected	1080.0
Silica, dissolved (mg/l)	4.82	21.9
$Si0_4$, dissolved (mg/l)	5.06	72.5
Copper, dissolved (micrograms/l)	undetected	109.3
Lead, dissolved (micrograms/l)	undetected	25.9
Zinc, dissolved (micrograms/l)	undetected	24.2
Arsenic, dissolved (micrograms/l)	undetected	5.2
Chromium, dissolved (micrograms/l)	0.624	3.1
Antimony, dissolved (micrograms/l)	undetected	19.5
Aluminum, dissolved (micrograms/l)	9.98	301.0
Phosphorus, dissolved (micrograms/l)	7.12	236.0
Orthophosphate (micrograms/l)	2.85	707.0
Nitrate-nitrogen (micrograms/l)	3.72	9.0
Nitrite-nitrogen (micrograms/l)	1.84	12.0
Ammonia-nitrogen (micrograms/l)	1.19	16.0
Nitrogen, organic, part. (micrograms/l)	47.0	70.0
Sulfate, dissolved (mg/l)	0.795	124.9
Chloride, dissolved (mg/l)	1.04‘	88.7

After these initial post-eruption surveys of Spirit Lake had been made in 1980, the lake's limnological recovery was tracked for a period of about 6 years (Larson and Glass, 1987). Some findings of this research follow: 1) The quality of Spirit Lake had improved greatly by 1986, with the strongest improvement occurring between 1980 and 1982; 2) the lake's epilimnion was always well-oxygenated during the summers that followed 1982, with dissolved-oxygen concentrations ranging from 6 to 8 mg/l; 3) the lake's hypolimnion continued to remain anoxic during the summer thermal stratification, although the rates of hypolimnetic oxygen consumption steadily diminished year after year; 4) concentrations of most ionic constituents, particularly iron and manganese, had decreased considerably by 1986, some falling close to pre-eruption levels; 5) densities of total bacteria were far less than what they had been shortly after the eruption; 6) the clarity of the lake had increased to such an extent that solar radiation during the summer of 1986 reached depths of 18-20 m (Secchi depth readings during September 1986 were 9 m, similar to pre-eruption measurements); and 7) greater lakewater clarity probably contributed to the recovery of the lake's phytoplankton commmunity, with 135 post-eruption species identified by October 1986.

Information concerning lake phytoplankton provided an important index for ascertaining the rate of limnological recovery. Unfortunately, information about Spirit Lake phytoplankton prior to the 1980 eruption of Mount St. Helens is virtually nonexistent, and aside from the possibility of obscure, unpublished records, we have only a brief mention of "diatoms" and "green algae" collected during the first limnological survey of the lake in 1937 (Crawford, 1986).

During the summer of 1980, when Spirit Lake was in its most degraded condition, investigators (Ward *et al.*, 1983) found fewer than 10 species of phytoplankton in the lake. These populations were also quite sparse, totalling 2.59 X 10^5 cells/liter. Later, on 21 October 1980, a surface-water sample collected by helicopter near the center of the lake yielded only 13 species, all of which were diatoms with a total density, 2.6 X 10^5 cells/liter, essentially the same as the first observation (Larson and Geiger, 1982). Other one-shot phytoplankton surveys of Spirit Lake were conducted in June 1981 (Dahm *et al.*, 1981), August 1982 (Smith and White, 1985), and September 1983 (Larson and Glass, 1987). The maximum number of species reported from these surveys was 20, by Smith and White in 1982. The total phytoplankton densities reported varied widely from 700 cells/liter (in June 1981) to a value given as less than 1 X 10^6 cells/liter (in August 1982). Phytoplankton growth and production in Spirit Lake during the first 2 years following the 1980 eruption may have been suppressed by chemicals derived from volcanic ash leachates (McKnight *et al.*, 1981), in addition to extremely poor water clarity which restricted photosynthesis.

A total of 135 phytoplankton species were identified in Spirit Lake between 1983 and 1986; 62 percent of these species were diatoms (Larson and Glass, 1987). Additionally, one possibly rare species remains unidentified. Phytoplankton primary production data (Table 2) indicate that the production of organic matter in Spirit Lake - resulting entirely from chemosynthetic processes in 1980 and 1981 (Dahm *et al.*, 1982; Ward *et al.*, 1983) - is now carried on photosynthetically by phytoplankton and higher vegetative communities.

The post-eruption limnological study of Spirit Lake was terminated in October 1986 because of funding and authorization limits. During the previous 6 years (1980-1986), over 100 helicopter-borne field trips had been made

Table 2. Phytoplankton Primary Production (carbon-14 technique), Spirit Lake, Washington. Data from Larson and Glass, 1987. These are the only primary productivity measurements on record for Spirit Lake.

Date	$mgC/m^2/hr$
23 Jul 1984	19.91
17 Jun 1985	12.57
18 Aug 1986	41.68
22 Sep 1986	23.32

to the lake to obtain limnological data, at a cost of roughly \$1.5 million (Larson and Glass, 1987). Since 1986, the lake has been visited only once (on 29 September 1989) to update the limnological database to further ascertain the lake's recovery (D.W. Larson, unpublished data).

Although Spirit Lake is a major feature in the Mount St. Helens National Volcanic Monument, which is managed by the U.S. Forest Service, no effort is being put forth presently to continue the important task of tracking the lake's limnological resurgence. This is highly unfortunate because Spirit Lake offers a rare opportunity to measure ecosystem restoration following a sudden and complete ecological disaster.

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Acknowledgements

I thank Ms. Kristie Duyckinck for assistance in collecting aquatic plants from Spirit Lake on 15 September 1991. Plant identifications were provided by Mr. Stan Geiger, Scientific Resources, Portland, Oregon, and by Mr. James Sweet, Aquatic Analysts, Portland, Oregon.

VIDEOPHILE

Melaleuca: Finding a Cure for an Exotic Pest

VHS, 13 minutes.

"Since its introduction, the Melaleuca tree has spread so rapidly throughout South Florida's native Everglades that it has become a serious problem. It now threatens to permanently replace and eliminate our natural plant communities and the animals that live in them. Where did it come from? How did it get here? Why is the tree spreading so rapidly and what is being done to control it? The purpose of this video is to address these questions and to focus attention on this serious environmental threat."

To order, contact: Artful Rhetoric Film & Video Inc., PO BOX 24-8582, Coral Gables, FL 33124. (305/674-9316). The price is \$16.00, plus tax and shipping.

Recycling Pesticide Containers - Proper Cleaning Techniques for Pesticide Containers

VHS, 8 1/2 minutes. English or Spanish.

This program shows users of pesticides how to properly clean and destroy pesticide containers, and how to store destroyed containers for recycling. Produced by the IFAS Information Television office.

To order, contact IFAS Publications, IFAS Building 664, Gainesville, FL 32611-0001, 904/392-1764. Specify IFAS number VT-364 for the English version, VT-366 for the Spanish version. The price is \$15.00, plus 6% tax for Florida residents.

Lake Restoration: An Investment That Pays Off

VHS, 22 minutes.

This video presents restoration case studies of several man-made Iowa lakes. It defines the major problems affecting the lakes (algae, reduced water clarity, run-off and other non-point nutrient sources) and presents costs and benefits of restoring water quality and recreation. It also suggests ways to design man-made lakes in order to reduce the amount of polluted run-off water that reaches them.

Produced by the Iowa Department of Natural Resources. For more information, contact Ross Harrison, Iowa Department of Natural Resources, Wallace State Office Building, Des Moines, IA 50319-0034, 515/281/8395.

The Causes and Prevention of Cancer

VHS, 98 minutes.

Dr. Bruce Ames, professor of biochemistry and molecular biology, UC-Berkeley, gives a lecture at the University of Florida on June 5, 1991.

Ames is well-known for his dissent from popular notions about man-made chemicals and whether or not they increase our risk of cancer.

Available to teachers for free from the Information Office, Center for Aquatic Plants. Address on page 16.

A LITTLE CLOSER - Bureau Chief Tom Brown

This summer, State Senator Tom Brown, co-author of Florida's major environmental protection laws, became Chief Tom Brown, one of many bureaucrats who must implement those same laws. Why did one of the "top two environmental senators", quit the legislature to take on one of Florida's environmental conundrums: are they "aquatic weeds" or "aquatic plants", and who cares anyway?

"I never planned to make politics a career, and I wasn't going to run again," Brown explains. So, he applied for and accepted the job of Chief, DNR Bureau of Aquatic Plant Management. By doing so, he is able to continue his life's work; that is, protecting Florida's environment.

As a representative and as a senator, Brown wrote or co-wrote milestone environmental legislation, including the Water Resources Act of 1981, the Water Quality Act of 1983, the Wetlands Act of 1984, and the Surface Water Improvement and Management Act (SWIM). By the time of his career change, he was vice-chairman of the Senate's Natural Resources Committee and chairman of the Ethics and Elections Committee.

As chief of one of the state's smallest but most highly visible bureaus, Brown is learning by experience the problems faced by government workers to fairly implement complex environmental laws. Over the years Brown has found that citizens (and legislators) are very supportive of environmental regulation in general. However, there are so many agencies involved that much essential management knowledge is lost across departmental lines. One department may promote one policy, while another may have a contrary policy. The result is a confusion of goals and messages among the various agencies, haphazard programming and funding, and consternation among the citizens.

Brown's top priority, therefore, is education about how aquatic plant management relates to the whole of environmental management. "We've got to make the activities of the Bureau more understandable to the public, the legislature, and other government agencies," Brown says. He cites two environmental education programs as examples of what he would like to see expanded: the IFAS Lakewatch program (volunteer groups monitoring water quality), and the DNR/IFAS educational videotape series (for the public and for agency field workers).

Brown believes that education will also lead to the "restructuring of the funding mechanism". For example, when people and the legislature realize the extent of environmental and other damage caused by fast-growing exotic aquatic weeds, more money will be put into "maintenance control" (the continuous control of even small amounts of certain aquatic weeds so that they will not proliferate and replace our native plants and animals).

To do the job properly, Brown believes the Bureau needs $14 - 16 million per year, some coming from the state's boat gasoline taxes and some from federal and local governments. Last year's budget was only about $7 million. To gain maintenance control of exotics like hydrilla, water hyacinths and melaleuca requires constant surveying, treatment and monitoring. It's not good management to wait until massive infestations are established before controlling the plants. It's much more environmentally friendly to manage smaller amounts of plants more often. But the additional effort and personnel required for proper management is simply lacking, Brown says.

Therefore, he proposes re-allocating a greater percentage of the state's gas tax for boats to the Bureau. Boat use increases in Florida every year; therefore, the gas tax could become a dedicated, continuing source of money for waterway management purposes. As it is now, the Bureau must re-justify its work every year. Brown is working with the Economic and Demographic Research branch of the legislature to determine if his idea is a reasonable funding approach.

In addition, he and the Bureau's "excellent staff" are "re-writing all the rules" to make aquatic plant management more understandable, more consistent and less costly to apply and enforce. He expects to combine the 16C-54 and 16C-50 programs into one set of rules and permitting requirements within several months.

Fifth generation Floridian Tom Brown was once known as "the environmental conscience of the legislature". What will be his legacy as a bureaucrat?

V.R.

Tom Brown was born in Daytona Beach. He obtained a BA degree from Lipscomb University and an MA from the University of Florida. He is "ABD" (All But Dissertation) for a doctorate. After several years as a retailer, Brown was elected to the Volusia County Council in 1978, to the Florida House in 1980, and to the State Senate in 1986. He became Bureau Chief this year.

BOOKS/REPORTS

TURNING THE TIDE - SAVING THE CHESAPEAKE BAY by T. Horton and W.M. Eichbaum, Chesapeake Bay Foundation. 1991. 327 pages.
(Order from Island Press, 1718 Connecticut Avenue, N.W., Suite 300, Washington, D.C. 20009, 1-800-828-1302. $22.95 cloth/$14.95 paper.)

Since the 1970s public and private groups have been working to reverse the apparent decline of the health of Chesapeake Bay. Now, fisheries seem to be on the rebound, submersed plants are re-establishing, and oxygen levels are increasing. The authors of this book, however, say this still "is a system in deep trouble and struggling for its very survival."

Written in Horton's award-winning, easy-to-read newspaper style, *TURNING THE TIDE* describes each of the many components of a watershed's ecosystem. Though it is about a particular bay, this book is also an ecology primer: the natural processes of aquatic ecosystems and the scientific jargon used to describe them are made understandable to anyone.

THE IMPACT OF DRAINING, BURNING AND FERTILIZER TREATMENTS ON THE NUTRIENT STATUS OF FLOATING TYPHA MATS IN A FRESHWATER MARSH by B.O. Krusi, Geobotanical Institute, Zurich. 1989. 124 pages.

This study was to test the "paludification-fire-nutrient release" hypothesis for a *Typha glauca* floating mat: can an ecosystem be revitalized through improved nutrient cycling conditions brought about by fire?

In a controlled experiment, various fertilizers, draining and burning were applied to plots in a Canadian marsh. The author found that nitrogen fertilization resulted in a significant increase in shoot standing crop. He found that burning did not release enough nitrogen to stimulate growth. Finally, he found that draining resulted in a significantly reduced nitrogen uptake and shoot standing crop.

METHODS OF BIOLOGICAL SAMPLING IN A LARGE DEEP RIVER - THE DANUBE OF AUSTRIA edited by U.H. Humpesch and J.M. Elliott, Federal Institute for Water Quality, Vienna. 1990. 83 pages.
(Order from Bundesanstalt fur Wassergute, Schiffmuhlenstrasse 120, P.B. 52, A-1223, Wien, Austria.)

These are detailed descriptions of sampling methods and devices used in the "Ecosystem Study Altenworth." The authors believe "this publication can be used as an example for other large river studies and as a guide to methods for monitoring large rivers."

Included are descriptions of a deck-incubator device for sampling phytoplankton for photosynthesis studies; a modified Schindler plankton trap for low density zooplankton sampling; a nitrogen-freezing corer adapted for sampling invertebrates on stony bottoms; several devices for sampling macroinvertebrates on stony bottoms; a multicorer RINIMUCO for sampling shallow silty/sandy sediments; colonization substrata and modified "slurp-guns" for sampling invertebrates in rough "riprap" areas; methods and devices for measuring macrophyte biomass and seasonal changes using echosounders; a method for measuring the amount of light consumed by stands of Potamogeton pectinatus; and the Downing method for collecting epiphytic invertebrates and the macrophytes they inhabit.

AQUASCAPING: PLANTING AND MAINTENANCE by D. Butts, J. Hinton, C. Watson, K. Langeland, D. Hall and M. Kane, University of Florida. 1990. 9 pages.
(Order from IFAS Publications, IFAS Building 664, Gainesville FL 32611-0001, 904/392-1764. Circular No. 912)

Short and to-the-point, this circular covers site selection, preparation, obtaining plants, planting and maintenance of aquatic plants for water gardens. Included are lists of recommended plants for shorclines, shallow water and deep water, and a list of "Plants to Avoid".

INTRODUCTION TO APPLIED PHYCOLOGY edited by I. Akatsuka, SPB Academic Publishing. 1990. 683 pages.
(Order from SPB Academic Publishing, P.O. Box 97747, 2509 GC The Hague, The Netherlands. US $160.00.)

This book deals with the commercial uses of algae, including algal biotechnology; genetic engineering; mariculture; biomonitoring; toxicity testing; and toxic compounds, antibiotics and other biologically active compounds that have been isolated from algae. Other applied phycology is described: medical and dental uses of algae, the manufacture of paper from seaweed, wastewater treatment using algae, mass culturing techniques, agronomic uses of seaweed and algae, and tissue culturing of algae.

WETLAND CREATION AND RESTORATION - The Status of the Science, edited by J.A. Kusler and M.E. Kentula, Island Press. 1990. 594 pages.
(Order from Island Press, Box 7, Covelo, California 95428. $60.00/cloth; $39.95/paper.)

This book contains 28 papers on the creation or restoration of fresh, brackish and salt water wetlands. "This report is a preliminary evaluation of the status of the science of wetland creation and restoration in the U.S.... It intentionally avoids a variety of key issues which were deemed more policy than scientific in nature."

The first part contains regional reviews: summaries of wetland creation and restoration experiences in broadly defined regions, such as "marshes of the southeast."

The second part is a series of theme papers on topics such as vegetation dynamics, project evaluation, and waterfowl management in created wetlands.

WETLANDS AND SHALLOW CONTINENTAL WATER BODIES, Volume I, Natural and Human Relationships, edited by B.C. Patten, SPB Academic Publishing. 1990. 759 pages.
(Order from SPB Academic Publishing, P.O. Box 97747, 2509 GC The Hague, The Netherlands. US $160.00)

Freshwater wetlands "...typified by permanently, seasonally or intermittently flooded soils and emergent macrophytic vegetation at some places or stages...are among the least studied and little known ecosystems on earth." The editors intend this book and its companion volume of case studies to be a compendium of modern knowledge about freshwater wetlands and shallow water bodies.

The contents include I) Wetland objects: definitions, classifications and human uses; II) Wetland elements: climate, mineral soils, hydrology, and biology and ecology; III) Wetland processes: land-water interactions, biogeochemical cycles, and wetlands in the biosphere; IV) Wetland impacts: on man, and assessment and valuation; V) Wetland management: shallow lakes and reservoirs, marshes, peatlands, forested wetlands, floodplains, agricultural reclamation and waste management, eutrophication, wastewater treatment, aquaculture and nature reserves; and VI) Wetland modeling: conceptualzation, ecological processes, ecosystem dynamics, and impact assessment.

ECOLOGY AND MANAGEMENT OF AQUATIC VEGETATION IN THE INDIAN SUBCONTINENT, edited by B. Gopal, Jawaharlal Nehru University, New Delhi. 1990. 257 pages.

(Order from Kluwer Academic Publishers Group, P.O. Box 989, 3300 AZ, Dordrecht, The Netherlands. US$150.00.)

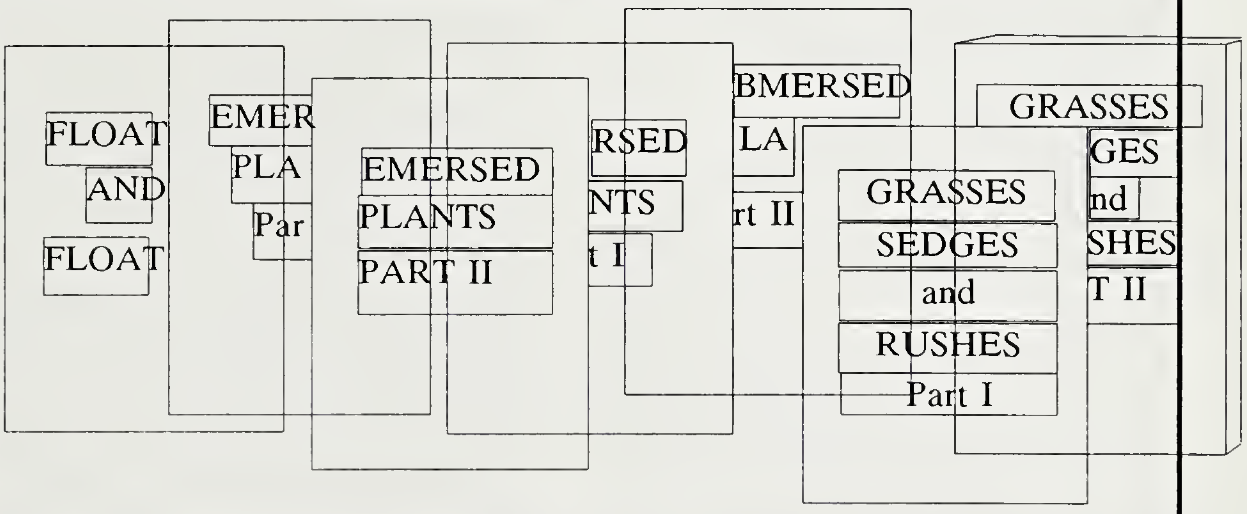
According to the editor, "this book is intended to provide the state of our knowledge of the aquatic and semi-aquatic [herbaceous] vegetation in the inland freshwaters of the subcontinent."

A section on the diversity of aquatic habitats in India is followed by descriptions of the aquatic plants found, and reviews of the studies on community structure and dynamics, environmental relations of some taxa, primary production and the role of aquatic plants in the nutrient dynamics of freshwater ecosystems. A section on management includes papers on traditional uses, control strategies, and conservation of aquatic plants. Needs for future research is the final chapter.

Aquatic and Wetland Plant Identification Videotape Series Nearly Complete

The aquatic and wetland plant identification videotape series will be completed by February, 1992. The seven-part series features 115 of the most common aquatic plants in Florida.

Plants are described in everyday language for non-botanists. They are shown in field and closeup situations, and important identifying characteristics are described. Users of the programs include high school and college students, waterfront homeowners, fishermen and other recreational water users, and of course, managers of Florida's lakes and rivers.



See page 3 for ordering information.

Field producer Karen Brown and videographer Phil Chiocchio have spent weeks finding and videotaping aquatic and wetland plants for the identification series. Weeks more were spent in "post-production": narrating, selecting shots, and editing the videotapes into interesting educational products. They have videotaped 115 plant species for the series of seven programs.

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic plant database since April, 1991.

The database has more than 32,000 items. To receive free bibliographies on specific plants and/or subjects, contact APIRS at the address shown on the mail label on page 16.

To obtain articles, contact your nearest state or university library.

Adamek, Z.; Fasaic, K.; Debeljak, L.
Lower temperature limits of plant food intake in young grass carp (*Ctenopharyngodon idella* Val.).
ICHTHYOLOGIA 22(1):1-8, 1990.

Agami, M.; Reddy, K.R.
Interrelationships between *Eichhornia crassipes* (Mart.) Solms and *Hydrocotyle umbellata* L.
AQUATIC BOT. 39:147-157, 1991.

Ahokas, H.
Absence of variation in endospermal proteins studied by electrophoresis in marginal populations of *Leersia oryzoides* (Poaceae), a threatened species in Finland.
ANN. BOT. FENNICI 27:309-316, 1990.

Andersson, B.
Identification and inventory of aquatic plant communities using remote sensing.
FOLIA GEOBOT. PHYTOTAX. 25:227-233, 1990.

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Long-term changes of salt marsh communities by cattle grazing.
VEGETATIO 89:137-148, 1990.

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FISHERIES 16(1):7-11, 1991.

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Movements and habitat use by grass carp in a large mainstream reservoir.
TRANS. AMER. FISH SOC. 119:553-561, 1990.

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RESTORATION AND MGMT. NOTES 8(2):124., 1990. (Abstract)

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Interspecific interactions among high marsh perennials in a New England salt marsh.
ECOLOGY 72(1):125-137, 1991.

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A deterministic model of the response of the threadfin shad to aquatic macrophyte control.
J. FRESHWATER ECOL. 5(4):445-454, 1990.

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Transport and processing of nitrogen in a tidal freshwater wetland.
WATER RESOURCES BULL. 27(3):389-408, 1991.

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Age and phytochemical composition of waterhyacinth (Pontederiaceae) leaves determine their acceptability to *Neochetina eichhorniae* (Coleoptera: Curculionidae).
ENVIRON. ENTOMOL. 20(1):323-334, 1991.

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The impact of hydroelectric developments on the Lechwe and its feeding grounds at Kafue Flats, Zambia.
IN: WETLAND ECOLOGY AND MANAGEMENT: CASE STUDIES, TASKS FOR VEGETATION SCI. 25 SERIES, WHIGHAM, D.F., GOOD, R.E. AND KVET, J., EDS., KLUWER ACAD. PUBL., DORDRECHT, THE NETHERLANDS, PP. 95-101, 1990.

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A local government's mitigation guidebook for seasonal wetlands along San Francisco Bay.
IN: SOC. FOR ECOL. RESTORATION: PROC. 1ST ANN. CONF., HUGHES, H.G. AND BONNICKSEN, T.M., EDS., 16-20 JANUARY 1989, OAKLAND, CALIFORNIA, SOC. FOR ECOL. RESTORATION, UNIV. OF WISCONSIN ARBORETUM, MADISON, PP. 86-96, 1990.

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AQUATIC BOT. 39:89-98, 1991.

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FE Mar. 91

Grass Carp No Longer Welcome in Three Central Florida Lakes

The voracious appetite of the grass carp has made it a victim of its own success in three small lakes in Winter Park, Florida. The Florida Game and Freshwater Fish Commission proposed to poison the grass carp, along with all other fish in the lakes, using Rotenone.

Although the lakes would quickly be restocked with favored species, the city commissioners were concerned about the prospect of hundreds of dead fish floating on the lakes, which are in the middle of prosperous suburban neighborhoods. One commissioner was quoted as saying, "Are we going to inject a new, untested chemical in the lake and wait to see what happens?"

The pilot program is necessary because the grass carp, after eating the fast-growing hydrilla and other aquatic weeds, began to consume desirable plants which provide habitat for game fish. Rotenone, which is widely used to kill "trash fish" in Florida lakes, was to be combined with food pellets to kill the grass carp.

FE Feb. 91

Record Fine Against Developer

A civil penalty of $170,000 as well as $3500 in legal costs has been approved in a St. John's Water Management District governing board consent order. The order is part of a settlement with the developers of a 100-acre mobile home park.

Fill was placed in a wetland before permits were acquired, and construction continued even after the District ordered activities to cease. As a result, about 16 acres of wetland were destroyed. According to WMD staff, civil penalty monies go into the Water Management Lands Trust Fund which funds the state's Save Our Rivers program.

FE Mar. 91

Biocontrol of Water Lettuce (*Pistia stratiotes*)

Florida's Lake Ocklawaha and Fisheating Creek were sites of release for biological control agents from Thailand: small, drab moths whose favorite food is the water lettuce. Initially, the moths were released in Fisheating Creek (Glades Co.) by the U.S. Corps of Engineers; a second release of 3000 moths was made in the western end of Lake Ocklawaha (Putnam Co.).

Most of the damage to the water lettuce will be done by the moths in their 3-to-4-week larval period when they eat the leaves. As adults they will eat less of the plant, but the females will lay about 600 eggs each.

FE June 91

Isolated Wetlands Proposed for Regulation

An estimated 68,000 small, isolated wetlands could be affected by proposed regulations of the St. Johns River Water Management District. Homeowners and small developers wanting to alter wetlands of less than one acre in size would have to obtain permits from the District. Wetlands of this size currently are not regulated by the U.S. Army Corps of Engineers.

FE May 91

Ethical Issues Raised in Consultant's Recommendation to Mow Wetland

In a letter to a developer, a consultant recommended that a jurisdictional wetland be mowed with a bushhog, disked and planted over before being shown to regulatory agencies. Although probably not illegal, the recommendation is being questioned from an ethical standpoint.

The consultant wrote the Ft. Myers developer that the hydric soils and dominance of wetland plants "...could allow the COE [U.S. Army Corps of Engineers] to claim these areas as jurisdictional." The site was described as a farm field drained completely by ditches that had been actively farmed for the past 50 years.

FE May 91

Invasion of Florida by Exotics gets Congressional Attention

Florida and Hawaii are ranked as the two states most affected by exotics. A congressional task force visited South Florida to study the invasion of the nation by exotic plants and animals.

The study group, part of a two-year review started last September by the U.S. Office of Technical Assessment, is "examining environmental and economic impacts of exotic species to determine how they enter the country, to suggest ways to control the threats, and to work with federal, state and local scientists to manage any future introductions."

Major emphasis is being placed on the aquatic "big three", namely hydrilla, water hyacinth and water lettuce, and the terrestrial "big three", melaleuca, brazilian pepper and Australian pine.

Florida Environments is a monthly newspaper filled with coverage of Florida's environmental stories. It is published by Dave Newport. Its writers include environmental reporters, consultants, scientists, environmentalists and bureaucrats.

Annual subscription is $15.85.

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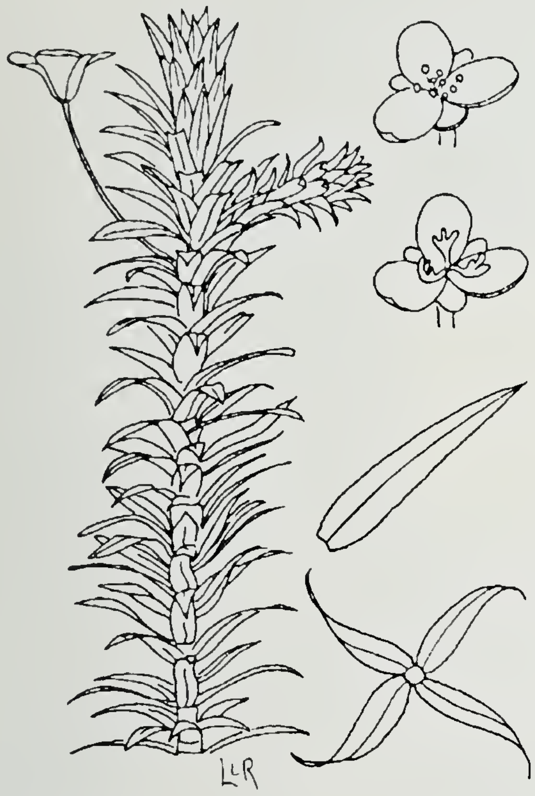

Egeria densa

To Master Life In Water

"Today it is no longer disputed that aquatic angiosperms have evolved from terrestrial angiosperms. It is, however, astonishing how often patristically unrelated groups have invaded the aquatic environment. Going through the list presented in this work I estimate that this evolutionary step from land to water has taken place at least 50 times but it could have happened 100 times or even more. Even within some genera such as *Phyllanthus* and *Ranunculus* evolution to the aquatic millieu has taken place more than once.

Aquatic plants have evolved from often very different genetic and ecological backgrounds. Also they have evolved at different times; some, presumably old ones, are aquatic at the level of order, while others, more recent, are isolated species in otherwise terrestrial genera. It is, nevertheless, wonderful that such a variety of solutions to a single problem, to master life in water, have resulted."

Christopher D.K. Cook

From Introduction, *Aquatic Plant Book,* by C.D.K. Cook. Published by SPB Academic Publishing bv, P.O. Box 97747, 2509 GC The Hague, The Netherlands. US $55.00.

MEETINGS

32ND ANNUAL MEETING, AQUATIC PLANT MANAGEMENT SOCIETY and THE INTERNATIONAL SYMPOSIUM ON THE BIOLOGY AND MANAGEMENT OF AQUATIC PLANTS. July 12-16, 1992, Marriott Hotel, Daytona Beach, Florida.

Topics for this international symposium will include the ecology and photosynthesis of aquatic plants, the use of plant biology to develop better control methods, and environmental impacts of various management options. Post-meeting field trips to the Central Florida and Everglades areas are planned.

For more information, contact Bill Rushing, Secretary-Treasurer, APMS, Inc., PO Box 2695, Washington DC 20013-2695.

SECOND ASTM SYMPOSIUM ON ENVIRONMENTAL TOXICOLOGY AND RISK ASSESSMENT: AQUATIC, PLANT & TERRESTRIAL. **April 26-29, 1992, Pittsburg, Pennsylvania.**

The American Society for Testing and Materials (ASTM) presents this symposium which will cover a broad range of environmental topics ranging from mechanisms of toxicity to the effects of contaminants on ecosystem structures.

For more information, contact Joseph W. Gorsuch, Symposium Chairman, Eastman Kodak Company, Environmental Sciences Section, HAEL, Building 306, Kodak Park, Rochester, New York 14652-3617, 716/588-2140.

SOUTHEAST REGIONAL LAKE MANAGEMENT CONFERENCE. **March 19-21, 1992, Kennesaw State College, Marietta, Georgia.**

Papers and posters will focus on lake management and restoration, watershed management, point source discharge assessments, stormwater and nonpoint source pollution assessments, citizen volunteer programs, community lake protection activities and government restoration programs. A conference proceedings will be published.

For more information, contact the NALMS national office at One Progress Boulevard, Box 27, Alachua, Florida 32615, 904/462-2554.

19TH ANNUAL CONFERENCE ON WETLANDS RESTORATION AND CREATION. **May 14-15, 1992, Sheraton Grand Hotel, Tampa, Florida.**

This annual meeting provides a forum for research results in the restoration, creation and management of freshwater, estuarine and marine systems; marsh, mangrove and seagrass restoration; mitigation, permitting and regulatory policies; mine reclamation and management techniques.

For more information, contact Frederick J. Webb, Hillsborough Community College, Plant City Campus, 1206 N. Park Road, Plant City, Florida 33566, 813/757/2104.

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AQUAPHYTE

This is the newsletter of the Center for Aquatic Plants and the Aquatic Plant Information Retrieval System (APIRS) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Natural Resources, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District, and IFAS.

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Karen Brown

AQUAPHYTE is sent to 3,500 U.S. and Canadian managers, researchers and agencies. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

Inclusion in AQUAPHYTE does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

Aquatic Plant Collecting A Cottage Industry in Florida

Collectors of *Egeria densa* (waterweed), shown here in the St. Marks River basin area, share in annual sales valued at $350,000 (for the state). Sold in aquarium stores, *Egeria* fetches from 35 cents to one dollar per bundle of ten stems. At this time, there is no limit on the collection of *Egeria*, which is an exotic plant in Florida. Even so, permits are required through the Florida Department of Natural Resources, Bureau of Aquatic Plant Management.